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ABSTRACTS

2013 ACCP Virtual Poster Symposium

May 21–22

ORIGINAL RESEARCH

ADR/Drug Interactions

1. A prospective study of uncontrolled glycaemia secondary to drug-drug interactions in type 2 diabetes mellitus patients at Penang general hospital in Malaysia. *Mohamed Anwar Hammad, Sr, M.Pharm.¹, Balamurugan Tangiisuran, Sr, M.Pharm., PhD², Noorizan Abd El Aziz, Sr, Pharm.D.², Yahaya Hassan, Sr, Pharm.D.²*; (1) Clinical Pharmacy, King Khalid University, Abha, Saudi Arabia; (2) Universiti Sains Malaysia, Penang, Malaysia

METHODS: A prospective cross-sectional study involving 200 diabetic patients admitted to Penang General Hospital with confirmed uncontrolled glycaemia (HbA1c test value >6.5%) were conducted over 2 months period. Information on patients' demographic criteria, co-morbidities, lab tests, medications, causes and managements of uncontrolled glycaemia were assessed and patient compliance were identified through direct interview. Drug interaction probability scale was used to assess the causality of drug interaction and computerized system for drug interaction checking was used to assess the severity and mechanism of drug interactions. The Drug interactions role in causing of uncontrolled glycaemia was further assessed.

RESULTS: We detected 86 drugs interactions caused uncontrolled glycaemia in 46 patients (23%) with a mean number of (1.9) and range of (1–4) drugs interactions per patient. One drugs interaction was identified for every 14 drug exposures. Drugs causing drug interaction-induced uncontrolled glycaemia were Hydrochlorothiazide (58.1%), Furosemide (13.9%), Salbutamol (9.2%), Cortisones (5.8%), Spironolactone (4.6%), Chlorothiazide (2.4%), Levothyroxine (2.4%), Acarbose (1.2%), Phenytoin (1.2%) and Risperidone (1.2%). Majority of these drug interactions were categorised as possible (77.9%) and preventable (37%).

CONCLUSION: Nearly one quarter of uncontrolled glycaemia induced by drug interactions, majority of these drug interactions are possible and more than third are preventable. Diuretic is the main cause of drug interactions induced uncontrolled glycaemia.

2. Dose response relationship between thiazides and hyponatremia. *Divaker Rastogi, Pharm.D., BCPS¹, Mitchell Pelter, Pharm.D., FCSHP²*; (1) Geriatrics/Special Needs Program, Kaiser Permanente Woodland Hills Medical Center, Woodland Hills, CA; (2) Kaiser Permanente Woodland Hills Medical Center, Woodland Hills, CA

OBJECTIVES: Based on the JNC 7 Guidelines, thiazides are first line agents in hypertension management. The expanding use of thiazides has led to increasing numbers of hospitalizations associated with thiazide-associated hyponatremia (HTAH). Rastogi et al. (2012) published a retrospective, case-controlled study evaluating risk factors for HTAH in 10,805 patients. However, the study did not address whether the risk of HTAH is dose-related. The objective of this study was to evaluate the correlation between thiazide dose and HTAH.

METHODS: The current analysis used data from Rastogi et al (2012). Since subjects were drawn from the Kaiser Permanente database, the majority of thiazide use was for the formulary-approved medications lisinopril/HCTZ or HCTZ alone. Thiazide doses of 12.5, 25, and 50 mg were studied. Univariate and multivariate analyses compared HTAH risk among these three dosages. The multivariate analysis was adjusted for age, weight, gender, type of thiazide diuretic, concurrent medications, and comorbid conditions. For both analyses, a thiazide dose of 25 mg was used as the reference group for comparison.

RESULTS: Eight thousand and ninety-five of the 10,805 patients in the original HTAH study were treated with either HCTZ or

lisinopril/HCTZ. The percentage of HTAH was 14%, 17.6%, and 21.7% for doses of 12.5, 25, and 50 mg, respectively ($p < 0.0001$ using 25 mg as reference group). Patients on 12.5 mg were 47% less likely to develop HTAH than with 25 mg (OR 0.53, 95% CI 0.40–0.71), while therapy with 50 mg resulted in 41% higher risk of HTAH (OR 1.41, 95% CI 0.80–2.49).

CONCLUSION: A dose-response relationship exists between increasing doses of thiazides and HTAH. The risk is greatest when transitioning from 12.5 to 25 mg. Though the data from this study suggest a higher risk with the 50 mg dose, further research is needed to confirm this association.

3. Incidence and characteristics of adverse drug events in hospice and palliative care patients during hospitalization. *Sewar S. Alsalmay, MSc, BCPS¹, Lama H. Nazer, Pharm.D, BCPS², Omar Shamieh, MD²*; (1) Pharmacy, King Hussein Cancer Center, Amman, Jordan; (2) King Hussein Cancer Center, Amman, Jordan

OBJECTIVES: To determine the incidence and characteristics of adverse drug events (ADEs) in hospice and palliative care patients during their hospital stay.

METHODS: A prospective observational study at a comprehensive teaching cancer center in Jordan. Patients who were admitted or referred to hospice and palliative care service were evaluated for any drug related adverse events during their hospital stay. The ADEs were identified by reviewing the medical records and during the multidisciplinary rounds. An ADE was defined as injury or patient harm resulting from medical intervention related to a drug. All suspected ADEs were reviewed by the palliative care physician and pharmacist. ADEs were classified based on the system involved, medication class, severity, and preventability.

RESULTS: Over 12 months, 408 patients admitted or referred to hospice and palliative care, 205 (50%) were males. Seventy four (18%) patients experienced a total of 95 ADEs during their hospital stay. Of the reported ADEs ($n=26$, 27%) were considered preventable. The ADEs were considered moderate in ($n=80$, 84%) cases, mild in ($n=15$, 16%) cases. The most common ADEs Based on the system involved were neurological ($n=32$, 34%), endocrine ($n=15$, 16%), gastrointestinal system ($n=13$, 14%) and haematological system ($n=8$, 8%). Drug classes most commonly associated with the suspected ADEs were opioids ($n=43$, 45%), diabetes mellitus agents ($n=13$, 14%), anticoagulants ($n=8$, 8%), and anti-epileptic agents ($n=6$, 6%).

CONCLUSION: ADEs are common among hospice and palliative care patients during hospitalization and were related mostly to opioids, diabetes mellitus agents, anticoagulants and anti-epileptic agents. And since 27% of the ADEs were preventable, prevention strategies should be implemented.

Ambulatory Care

4. The role of the clinical pharmacist in modifying cardiovascular disease risk factors. *Autumn Bagwell, Pharm.D. Candidate, 2013¹, Lana Saad, Pharm.D.², Jessica Skelley, Pharm.D.², B. DeeAnn Dugan, Pharm.D.², Thomas Woolley, PhD²*; (1) McWhorter School of Pharmacy, Samford University, Birmingham, AL; (2) Samford University, Birmingham, AL

OBJECTIVES: Assess the effect of intensive clinical and educational interventions aimed at reducing risk factors for Cardiovascular Disease (CVD), implemented by clinical pharmacists, on modifying risk factors in targeted patients at high risk for CVD.

METHODS: Patients with at least two risk factors for CVD were identified at two clinics by conducting a pre-intervention survey of CVD risk factors. Patients were monitored over a period of 6 months with follow up conversations conducted every 4 weeks by phone and at subsequent physician and/or clinical pharmacist visits. Pharmacist-directed clinical interventions including medication adjustment and initiation, counseling, and aid in accessing medication assistance programs were conducted over 6 months.

A post-intervention survey was conducted at the end of the study period to detect modified risk factors.

RESULTS: Over a 6 month follow-up of 47 patients, statistically significant reductions occurred in total number of CVD risk factors, systolic and diastolic blood pressures, and A1C. Reductions also occurred in LDL level, weight, and changes in smoking behavior and physical activity.

CONCLUSION: Results showed that increased patient counseling on adherence and lifestyle changes along with increased disease state monitoring and medication adjustment led by a clinical pharmacist can decrease risk factors in patients with multiple risk factors for cardiovascular disease.

5E. Implementation of MTM recommendations by community IPPE P3 student pharmacists post older adult interprofessional team home visit. *Mary Beth O'Connell, Pharm.D.¹, Danielle Adams, III, Pharm.D.², Shannon Jacobs, III, Pharm.D.², Lea Olson, III, Pharm.D.², Carol Bugdalski-Stutrud, B.S.Ph.², Jennifer Mendez, Ph.D.³, Cassandra Bowers, Ph.D.⁴, GERALYNN SMITH, M.S.²;* (1)Pharmacy Practice Department, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (2)Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (3) School of Medicine, Wayne State University, Detroit, MI; (4) School of Social Work, Wayne State University, Detroit, MI Presented at the American Pharmacists Association Annual Meeting & Exposition, Los Angeles, CA, March 1-4, 2013.

6. Retrospective review of dyslipidemia outcomes in clinical video tele-health. *Jared Wonders, Pharm.D.¹, Courtney Kominek, Pharm.D.¹, Rachel Chandra, Pharm.D.¹, Brian Burke, MD¹;* (1)Dayton Veterans Affairs Medical Center, Dayton, OH

OBJECTIVES: To evaluate dyslipidemia outcomes in patients managed via clinical video telehealth (CVT). CVT is an alternative healthcare delivery model primarily utilized for patients in rural areas. In 2011 a CVT clinic was initiated and led by clinical pharmacists at the Dayton VAMC in an effort to optimize lipid outcomes in patients who live in rural Ohio.

METHODS: Patients were referred to the CVT clinic by their primary care team. A CVT clinic appointment consisted of a provider in the tertiary care center, the patient, and a CVT nurse located at the rural clinic site. Clinical recommendations, lifestyle changes and therapeutic modifications were accomplished at each clinic visit. The primary end point was to determine the percent change in low density lipoprotein (LDL). The secondary outcomes, percent changes in high density lipoprotein (HDL) and triglyceride (TG), were evaluated using a paired t test with the Bonferroni adjustment. LDL levels above and below 100 mg/dL prior to and after data collection were analyzed using the chi-squared test. Cholesterol goals were determined from Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III) guidelines.

RESULTS: A total of 72 patients were included in this retrospective study. The primary outcome revealed a 4.25% decrease in LDL and reached statistical significance ($p=0.01$). Triglycerides showed a 4.9% decrease ($p=0.062$) with a 3.7% increase in HDL ($p=0.087$). Before enrolling in CVT clinic, 24 patients (34%) had an LDL reading of <100 ; at the end of data collection 39 patients (56%) had an LDL reading of <100 . This finding was statistically significant ($p=0.001$).

CONCLUSIONS: CVT clinics managed by clinical pharmacists are an effective modality in the management of dyslipidemia amongst rural patients.

Cardiovascular

7. Low-molecular-weight heparin prescribing for venous thromboembolism in cancer patients. *David Stewart, Pharm.D.¹, Somi Rikhye, MD, MPH², Brian Odle, Pharm.D.³, Emily Flores, Pharm.D.³;* (1)Department of Pharmacy Practice, East Tennessee

State University College of Pharmacy, Johnson City, TN; (2) East Tennessee State University College of Medicine, Johnson City, TN; (3) East Tennessee State University College of Pharmacy, Johnson City, TN

OBJECTIVES: To determine the prescribing frequency of low-molecular-weight heparin (LMWH) for the initial chronic management of venous thromboembolism (VTE) in patients with cancer.

METHODS: A retrospective analysis was conducted of patients with a diagnosis related group code for any solid cancer and any venous thromboembolism from 2005 to 2010. Adult patients were included if they had been discharged with an active diagnosis for cancer and a newly diagnosed deep vein thrombosis or pulmonary embolism. Patients were excluded if they were receiving warfarin therapy prior to admission, were pregnant, had an inferior vena cava filter prior to or during admission, or had a contraindication to anticoagulant therapy at discharge. The chi-square was used to assess the primary endpoint, which was the prescribing of LMWH as the primary agent for the treatment of VTE at the time of discharge. Logistic regression analysis was used to determine the prescribing of LMWH by general practitioners compared to hematologists/oncologists.

RESULTS: One hundred thirty-five patients were evaluable based on the inclusion and exclusion criteria. Nine patients (7%) were prescribed LMWH and 107 (79%) were prescribed warfarin at the time of discharge ($p < 0.0001$). The odds ratio for a general practitioner prescribing LMWH instead of warfarin was 0.16 (95% CI: 0.03-0.85, $p=0.031$) when compared to hematologists/oncologists.

CONCLUSION: LMWH has been shown to be more efficacious for preventing recurrence of venous thromboembolic events in patients with underlying malignancy when compared to warfarin for the first 3-6 months of chronic therapy. The American Society of Clinical Oncology and the American College of Chest Physicians both state preference of LMWH for treating VTE in the initial 3-6 months. Our study showed poor compliance with this recommendation by all prescribers; however, hematologists/oncologists were significantly more likely to prescribe this regimen compared to generalists.

COMMUNITY PHARMACY PRACTICE

8. The assessment of self-medication utilization in pain management at a community pharmacy setting. *Betül Okuyan, PhD¹, Mustafa Vakkas Atalay, Undergraduate², Ceren Sahin, PhD student², Duygucan Sahin, Undergraduate², Fikret V. Izzettin, Professor¹, Mesut Sancar, Associate Professor¹;* (1)Clinical Pharmacy Department, Faculty of Pharmacy, Marmara University, Istanbul, Turkey; (2)Marmara University Faculty of Pharmacy, Istanbul, Turkey

OBJECTIVES: The aim of the study is to determine participants' attitude toward self-medication for pain and to obtain currently patient education given by community pharmacist about the self-medication.

METHODS: A cross sectional study was conducted in 18 community pharmacy in Istanbul, Turkey during February- May 2012. Patients were eligible for the study if they utilized analgesic without prescription at least 4 weeks prior to the present study and were older than 18 years old. The study data of patients were recorded through face to face interviews in the community pharmacy. The type of analgesic, VAS (Visual Analog Scale), subjects' attitude toward self-medication in pain, and education given by pharmacist regarding analgesics were documented.

RESULTS: Among 239 participants (mean of age 36.54 ± 13.87 years old), the most frequently used medications for pain were; paracetamol (36%), flurbiprofen (18.4%), and naproxen sodium (9.7%). The mostly experienced type of pain which had been seen in last 4 weeks prior to the study was headache ($n=173$). 30.1% of participants reported chronically medication use related to a chronic disease. 26.8% of them were detected gastrointestinal illnesses and 23.8% were using at least one w/w prescribed gastrointestinal medication during the present study. The mean of participants' VAS score was 6.48 ± 2.00 . One hun-

dred and seventy-three (72.4%) participants declared that they consulted with a healthcare professional including a pharmacist (n=63) before taking analgesics. 81.2% were educated by community pharmacist about purpose of use and 89.5% were educated about how to use it. On the other hand, 77.4% were not informed about food and drug interactions and 74.1% were not informed about what to do in the case of a missing dose.

CONCLUSION: Pharmacists should determine patients' attitude toward self-medication with analgesic to provide consultation services including selecting rational medication and providing education to their patients in pain management.

9. Medication adherence in the homeless population in an intermountain West City. *Elizabeth Unni, B.Pharm., MBA, PhD¹, Riki Ashment, Pharm.D. Candidate¹, Elizabeth Miller, Pharm.D.², Andrew Draper, Pharm.D., MSA¹;* (1) Roseman University of Health Sciences College of Pharmacy, S Jordan, UT; (2) Fourth Street Pharmacy, Salt Lake City, UT

OBJECTIVES: Homelessness is a situation when people or household are unable to acquire and/or maintain housing they can afford. Approximately 17% of the homeless are also chronically ill. Studies have often not measured medication adherence among the homeless, probably due to lack of pharmacy records. The purpose of this study was to estimate medication adherence to chronic medications among the homeless in Salt Lake City, Utah based on pharmacy records.

METHODS: A retrospective study design was used based on the pharmacy records from the Fourth Street Pharmacy. The study focused on: (1) asthma medications including Fluticasone/Salmeterol, Tiotropium, Budesonide/Formoterol, Albuterol/Ipratropium, and Beclamethasone; (2) diabetes medications including Insulin Glargine, Metformin, Glipizide Extended Release, and Insulin Lispro; (3) cholesterol lowering statins including Simvastatin and Atorvastatin; and (4) psychiatric medications including Buspirone, Risperidone, Olanzapine, Quetiapine, Escitalopram, Venlafaxine Extended Release, and Mirtazapine. Data was collected between November 1, 2010 and February 28, 2011 on the following variables: date of original prescription, number of refills noted on the original prescription, date of first fill of the prescription, date of 2nd, 3rd, and 4th refills, age, gender, and race. Primary adherence was calculated as picking up the medicine within 30 days of the original prescription. Secondary adherence was measured as Continuous Measure of Medication Gaps (CMG) and adherence was defined as having an overall CMG <20%.

RESULTS: The primary adherence was close to one hundred percent for asthma medications, statins, and psychiatric medications and was 87% for diabetes medications. The medication adherence based on CMG was 78.4% with asthma medications, 81.4% with diabetic medications, 82% with statins, and 65% with psychiatric medications.

CONCLUSIONS: The study concluded that this population has better adherence with the selected asthma, diabetes, cholesterol lowering, and psychiatric medications than the general population which is often 50%.

Critical Care

10. Norepinephrine dosing in obese patients for the management of septic shock. *John Radosevich, Pharm.D., BCPS¹, Asad E. Patanwala, Pharm.D., BCPS¹, Brian Erstad, Pharm.D., FASHP, FCCM, FCCP, BCPS¹;* (1) The University of Arizona College of Pharmacy, Tucson, AZ

OBJECTIVES: It is unknown if norepinephrine dosing needs to be weight-based for hemodynamic support of obese patients. The objective of this study was to evaluate the effect of non-weight-based dosing of norepinephrine on hemodynamic parameters in obese and non-obese patients.

METHODS: This was a retrospective cohort study conducted in an academic medical center. Medical records of adult patients with septic shock between July 2010 and June 2012 were reviewed. Patients were included if they received norepinephrine monotherapy for hemodynamic support for at least 1 hour.

Patients were categorized into two groups based on body mass index (BMI): (1) obese (BMI ≥ 30 kg/m²) or (2) non-obese (BMI < 30 kg/m²). The primary outcome was the proportion of patients who achieved a goal mean arterial pressure (MAP) of ≥ 65 mm Hg within 1 hour of norepinephrine initiation. This was compared between the two groups using a Fisher's exact test. Ordinal variables were compared using the Wilcoxon rank-sum test with values expressed as medians and interquartile ranges.

RESULTS: A total of 200 patients were included in the final cohort (100 in each group). The median BMI for the obese and non-obese groups was 35.6 (IQR 31.8–42.0) and 23.6 (IQR 21.2–26.3) respectively (p < 0.001). The median age for the obese and non-obese groups was 57.5 years (IQR 50.0–65.5) and 65.0 years (IQR 56.0–77.0), respectively (p < 0.001). There were no other significant differences between groups, with regard to demographics, source of infection, severity of illness, vital signs, fluid use, or non-weight-based norepinephrine infusion rates (mcg/min). Goal MAP was achieved in 81% of obese patients and 72% of non-obese patients (p=0.182) at 1 hour. At 6 hours, goal MAP was achieved in 84% of obese patients and 91% of non-obese patients (p=0.243).

CONCLUSION: Norepinephrine infusions do not need to be weight-based for hemodynamic support of obese patients.

11. Comparison of low-molecular-weight heparin and unfractionated heparin for venous thromboembolism prophylaxis in trauma patients. *Aimee Gowler, Pharm.D.¹, Brian Erstad, Pharm.D., FASHP, FCCM, FCCP, BCPS², Andrew Tang, MD¹;* (1) University of Arizona, Tucson, AZ; (2) The University of Arizona College of Pharmacy, Tucson, AZ

OBJECTIVES: To compare the incidence of clinically significant venous thromboembolism (VTE) in trauma patients administered pharmacological prophylaxis with enoxaparin or unfractionated heparin (UFH).

METHODS: This study was a retrospective cohort analysis of trauma patients over a 64 month time period with an Injury Severity Score ≥ 9 administered subcutaneous prophylaxis with enoxaparin 30 mg every 12 hours or UFH 5000 units every 8 or 12 hours. Patients were excluded for a hospital length of stay <7 days, except for VTE-associated death. Clinically significant VTE were defined as thrombotic and embolic pathologies identified by investigations for clinically apparent symptoms and signs. Incidence of VTE was gathered through ICD-9 coding or documentation in the institution's Trauma Registry.

RESULTS: A total of 8639 patients with an ISS ≥ 9 were admitted during the study period and 1225 patients met full inclusion criteria. The groups of enoxaparin and heparin every 8 and 12 hours included 237 and 988 patients, respectively. Differences found between the groups include the UFH group were older (41.9 \pm 18.3 vs 46.8 \pm 21.2 years, respectively, p=0.001) and had longer lengths of ICU (5.8 \pm 6.5 vs 8.3 \pm 7.8 days, respectively, p < 0.001) and hospital stay (13.3 \pm 8.1 vs 15.0 \pm 9.9 days, respectively, p=0.019). There was no significant difference in VTE occurrence based on type of heparin regimen (p=1), nor were any factors significantly predictive of VTE in the logistic regression analysis.

CONCLUSION: We found no difference in incidence of VTE between prophylaxis with enoxaparin or UFH and conclude further research is indicated to determine any potential difference in VTE occurrence related to UFH and low-molecular weight heparin dosing regimens.

12. Effect of aerosolized colistin on the ventilator circuit: a pilot case-control study. *Iyad Ghonimat, RT, MHSM¹, Lama H. Nazer, Pharm.D., BCPS², Flsteen Aqel, RT³, Feras Hawari, MD³, Jennifer Le, Pharm.D., BCPS-ID⁴;* (1) Respiratory Therapy, King Hussein Cancer Center, Amman, Jordan; (2) Pharmacy Department, King Hussein Cancer Center, Amman, Jordan; (3) King Hussein Cancer Center, Jordan; (4) Skaggs School of Pharmacy and

Pharmaceutical Sciences, University of California San Diego, La Jolla, CA

OBJECTIVES: After several reports of frequent changes of the ventilator circuit components in mechanically-ventilated patients receiving aerosolized colistin (AC), we decided to conduct this study to evaluate the effect of administering AC on the ventilator circuit.

METHODS: This was a 1-year prospective pilot case-control study. The control group consisted of 25 consecutive mechanically-ventilated patients, while the case group consisted of 25 consecutive mechanically-ventilated patients who received AC, 1 million unit every 8 hours. Patients on mechanical ventilation or AC for <24 hours were excluded. A respiratory therapist inspected the mechanical ventilator circuit four times daily and whenever a ventilator alarm was reported. The ventilator circuit component was changed if the alarm did not subside after all necessary measures were performed and proved ineffective.

RESULTS: The demographics of the control and case groups were similar. The mean duration of mechanical ventilation was 22.1 ± 13.6 (SD) and 15.1 ± 9.2 (SD) days for cases and controls, respectively. Both groups received inhaled albuterol during mechanical ventilation but no patient received aerosolized non-colistin antibiotics. AC was prepared by the pharmacy based on manufacturer's recommendations (Colomycin, Forest Laboratories, UK). Among those who received AC, 23 patients required change in at least one of the circuit components (flow sensor, membrane, or nebulizer kit). The median number of changes (range) per person in the flow sensor, exhalation membrane, and nebulizer kit were: 2 (1–3), 2 (1–6), 1 (1–2), respectively. Formation of large amounts of white crystals, which resembled the colistin powder, was observed on ventilator components that required changing. The flow sensor was changed in two control patients, but white crystals were absent.

CONCLUSION: AC was associated with crystal formation and frequent changes of the ventilator circuit components. Large studies are needed to evaluate the effect of such complication on patient outcomes and cost, and to identify methods to prevent this complication.

Education/Training

13. The sustainability of improvements to pharmacy practice and learning behaviors from continuing professional development. *Karen McConnell, Pharm.D.¹, Thomas Delate, PhD², Carey Newlon, RPh²; (1) Department of Pharmacy, Kaiser Permanente Colorado, Denver, CO; (2) Kaiser Permanente Colorado, Aurora, CO*

OBJECTIVES: In 2008, Kaiser Permanente Colorado (KPCO) conducted a randomized trial of pharmacists to assess the effect of continuing professional development (CPD) training, compared to traditional continuing pharmacy education (CPE), on perceptions of pharmacy practice and learning behaviors. This study's objective was to assess the long-term sustainability of changes to pharmacy practice and learning behaviors from CPD training.

METHODS: KPCO pharmacists who participated in the original CPD trial were surveyed approximately 3 years later. Participants' perceptions on pharmacy practice and learning behaviors were assessed. Survey responses were appended to original trial data. Responses from the original follow-up and sustainability surveys were dichotomized as binary outcomes (e.g. agree vs any other response). Analyses were conducted between and within groups to assess for changes over time.

RESULTS: Of the original 100 pharmacists enrolled, 72 intervention (n=35) and control (n=37) pharmacists participated. Compared with control participants, a higher percentage of intervention participants reported in the sustainability survey that they had identified personal learning objectives (68.6% vs 43.2%, $p < 0.05$) but the intervention arm's percentage decreased from the follow-up survey (94.3%, $p < 0.01$). Compared with the follow-up survey, lower percentages of intervention participants reported documenting their learning plan (82.9–22.9%,

$p < 0.001$), selecting a program based on potential interest (68.6–40.0%, $p < 0.05$), and participating in learning by doing (42.9–14.3%, $p < 0.01$) in the sustainability survey. In the sustainability survey, a higher percentage of intervention compared to control participants reported utilizing the CPD concept in the past year (45.7% vs 8.1%, $p < 0.001$). The majority of intervention (85.7%) and control (64.9%) participants agreed that CPD should be an option for state board requirements for pharmacist re-licensure.

CONCLUSION: The sustainability of a CPD intervention was limited. While CPD-trained pharmacists reported utilizing CPD concepts at a higher rate than control pharmacists, there was substantial decay in their utilization over time.

14. The prevalence of relational aggression in a college for health professions. *Allana Suher, Pharm.D.¹, Louise Suit, EdD, RN², Lauren Burt, Pharm.D.², Janet Houser, PhD², Stephen Luckey, PhD², Daniel Roysden, PhD²; (1) School of Pharmacy, Regis University, Denver, CO; (2) Regis University, Denver, CO*

OBJECTIVES: To determine the prevalence of relational aggression among health professions students.

METHODS: Three hundred and ninety-nine health professions students (69% response rate) completed a 15-item Student Interaction Assessment. This tool measured six subscales: overt physical aggression, overt and covert emotional aggression, intimidation, electronic media aggression, and social isolation. Content validity was established in 30 undergraduate pre-health professions students ($r = 0.82$).

RESULTS: More than 13% of respondents reported being "physically pushed or shoved," and 5% experienced "physical threats" in the last year. Male, divorced, and widowed students experienced more physical aggression as compared to other student populations. 10.6% of respondents had private information shared electronically without their permission, and 7.7% reported that others had tried to damage their reputation via social media. Relational aggression was associated with a loss of confidence.

CONCLUSION: Prevalence was found for relational aggression in overt physical and emotional abuse, intimidation, and loss of confidence. Electronic media was used to share private information and damage the reputations of fellow students. These results inform university administrators about the prevalence of relational aggression amongst health professions students and the support services that may be needed for those students who have experienced abuse.

15. Publication tendencies of pharmacy and medical journals over the past three decades. *Jonathan Potter, M.S., Pharm.D. Student¹, Dan Do, Pharm.D. Student¹, Ariel Zlich, Pharm.D. Student¹, Marisa Ramsaroop, Pharm.D. Student¹, Sandra Benavides, Pharm.D.¹; (1) College of Pharmacy, Nova Southeastern University, Davie, FL*

OBJECTIVES: The advancement of medical science over the past three decades, coupled with the increase of healthcare professionals and researchers, has led to corresponding increases in the volume and complexity of medical literature; however, a higher number of publications may not necessarily correlate with an increase in original research. The objective of this study was to determine and compare publishing rates between original research, case reports, and review articles over the previous three decades in pharmacy and medical journals.

METHODS: Select pharmacy and medical journals (n=8) in print for at least 20 years and indexed in Medline were evaluated. All journal material available from Medline for the years of 1988–1989, 1998–1999, and 2008–2009 was compiled into a database and verified manually against each journal's table of contents for accuracy. The publications were categorized either as original research, review articles, case reports, or miscellaneous based on the publication-types classification system used by the National Library of Medicine PubMed indexing system.

RESULTS: Publishing rates for original research, review articles and case reports were each consistently higher for pharmacy jour-

nals than medical journals for all years. No publication type exhibited significant variance across decades. The prevalence of original research averaged 26.9% for pharmacy and 15.8% for medicine ($p=0.0399$). Review articles averaged 22.5% for pharmacy and 11.5% for medicine ($p=0.0187$). Case reports were 13.8% and 11.0% (NS) in pharmacy and medicine, respectively. Individual journals varied widely in their publishing rates and no individual journal was consistently higher or lower than other journals in any one category.

CONCLUSION: Original research continues to make up a minority of publications and there is little evidence for any significant change in publication rate. Pharmacy journals maintain higher publishing frequencies in original research, review articles, and case reports compared to medical journals.

16. Using Google services as an innovative educational tool for advanced pharmacy practice experience rotations. *Kristin Watson, Pharm.D., BCPS¹, Sandeep Devabhakthuni, Pharm.D., BCPS¹;* (1) University of Maryland School of Pharmacy, Baltimore, MD

OBJECTIVES: To describe how Google Inc. "Google" services can be used for coordination of pharmacy resident and/or student patient care rotation requirements and activities.

METHODS: Preceptors and pharmacy students and residents employed Google Drive and Calendar for completing an inpatient cardiology rotation. The following items were stored on Google Drive as a repository: rotation syllabus and survival tips, presentation guides, and various required readings. Google Calendar was used to create a rotation calendar including various scheduled meetings and deadlines for completing rotation assignments.

RESULTS: By posting readings (e.g. guidelines and articles) and templates for assignments in a central database such as Google Drive, preceptors ensured that students had clear expectations for assigned activities like preparation for topic discussions. Preceptors, students, and residents were also able to access posted documents and calendars readily on any computer or mobile device. Trainees were able to post copies of handouts and readings that may be beneficial to others completing the same rotation. Storing information in Google Drive also minimized the amount of emails that needed to be sent to trainees during the course of the rotation. Google Calendar offered flexibility in syncing various calendars and allowed for real-time schedule updates. Students and residents also added details regarding their obligations to this calendar.

CONCLUSION: Using various Google programs provided a central repository of information for preceptors and their students and residents on rotations. These electronic repositories minimized the amount of emails that need to be sent and maintained during the course of a rotation. The preceptors felt that this type of technology served as an effective communication tool, which saved a significant amount of time spent on correspondence. The trainees understood the expectations for rotation activities more clearly.

17. Evaluation of need and desire among new pharmacy practitioners for motivational interviewing to be incorporated into pharmacy education curricula. *Dawn Battise, Pharm.D.¹, Michael DeValve, Ph.D.², Daniel Marlowe, Ph.D.³, Beth Beasley, Pharm.D.⁴, Susan Miller, Pharm.D., MBA, BCPS, FCCP³;*

(1) School of Pharmacy, Wingate University, Wingate, NC; (2) Fayetteville State University Department of Criminal Justice; (3) Southern Regional Area Health Education Center; (4) Cape Fear Valley Medical Center

OBJECTIVES: This study evaluated need and desire expressed by new pharmacy practitioners for motivational interviewing (MI) to be incorporated into pharmacy education curricula as a method to fulfill the Accreditation Council for Pharmacy Education (ACPE) requirement for patient communication training.

METHODS: Between October and December 2011, an electronic survey was distributed to North Carolina pharmacists in practice for <8 years. Need for MI was evaluated based on respondents' level of preparedness in response to patient vignettes which mod-

eled the traditional and MI styles of counseling. Vignettes were individualized based on primary practice area. Desire was evaluated based on respondents' belief that MI should be incorporated in pharmacy school curricula and if respondents stated MI would be applicable in their practice.

RESULTS: The survey response rate was 12.4% with 257 responses viable for statistical analysis. Less than 75% of respondents were well prepared to counsel using traditional techniques and less than 60% were well prepared to counsel using MI techniques. Ninety-four percent stated MI should be incorporated into pharmacy education curricula and 85% stated MI would be applicable to current practice. Pharmacists in the ambulatory care and community settings expressed the greatest need for both counseling styles and expressed the greatest desire for MI incorporation.

CONCLUSIONS: Based on the low level of preparedness to counsel using either counseling style there is a need for patient communication training to be reevaluated. The strong desire expressed by new pharmacy practitioners to incorporate MI into pharmacy education curricula indicates schools of pharmacy may consider MI training to fulfill this ACPE requirement. The increased need and desire expressed by pharmacists in the ambulatory care and community settings may be influenced by more frequent opportunities for patient engagement. Schools may consider additional MI training for students who anticipate entering these areas of practice.

18. Understanding motivations to participate in clinical trials among ethnically diverse populations. *Robert Lalley, Pharm.D., MS¹, Brenda Jamerson, Pharm.D.¹;* (1) Campbell University College of Pharmacy and Health Sciences Clinical Research Center, Buies Creek, NC

OBJECTIVES: Ethnic minorities are significantly under-represented in clinical trials. This study examined key factors that influence enrollment of this population in clinical trials. These data will be utilized to develop an evidence based model that pharmacists involved in clinical trials can use to modify recruitment practices to increase enrollment and retention of minority subjects in clinical research.

METHODS: After obtaining IRB approval, a focus group of African American men and women were surveyed regarding their perceptions of clinical research and willingness to participate in clinical trials. Demographic data were collected in order to identify trends in how these factors differ among subsets with various geographic, educational, and socioeconomic backgrounds.

RESULTS: Sixty nine subjects participated in the survey: 69% were male, 78% were age 54 or older, and 41% were from an urban setting. For the primary endpoint of willingness to participate in clinical trials, subjects were more likely to respond positively if they were from an urban location vs rural (68% vs 43%; $p=0.047$) or if they had no health insurance (100% vs 52%; $p=0.02$). Individuals were also more willing to participate if the trials were beneficial to their medical condition ($p=0.004$), for access to other healthcare providers ($p=0.0009$), if asked by a personal physician ($p=0.0008$), if asked by a study investigator ($p=0.0002$), and if the time commitment was reasonable ($p=0.01$). Although monetary incentive was commonly identified as a key factor (by 49% of participants), it was not found to have a significant impact on subjects reported willingness to participate in a clinical trial (61% vs 47%; $p=0.27$).

CONCLUSION: Geographic, socioeconomic, and cultural characteristics of potential clinical research subjects affect willingness to participate. By understanding these attributes, clinical pharmacists may be able to overcome recruitment barriers and include more ethnically diverse populations in clinical trials.

19E. Learning assessment of the Peruvian Amazon study abroad program. *Mary Beth O'Connell, Pharm.D.¹, Shannon Priest, III, Pharm.D.², Barbara Brodman, Ph.D.³, Ruth Nemire, B.S.Ph, Pharm.D., Ed.D.⁴;* (1) Pharmacy Practice Department, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne

State University, Detroit, MI; (2) Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (3) Global Awareness Institute, Fort Lauderdale, FL; (4) American Association of Colleges of Pharmacy, Alexandria, VA

Presented at the American Pharmacists Association Annual Meeting & Exposition, Los Angeles, CA, March 1–4, 2013.

20E. Health care student learning about interprofessional older adult home care. *Mary Beth O'Connell, Pharm.D.¹*, Jordan Masse, III, Pharm.D.², Cassandra Bowers, Ph.D.³, Jennifer Mendez, Ph.D.⁴, Carol Bugdalski-Stutrud, B.S.Ph.², GERALYNN SMITH, M.S.²; (1) Pharmacy Practice Department, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (2) Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (3) School of Social Work, Wayne State University, Detroit, MI; (4) School of Medicine, Wayne State University, Detroit, MI Presented at the American Pharmacists Association (APhA) Annual Meeting & Exposition, Los Angeles, CA, March 1–4, 2013.

21E. Older adult satisfaction with P3 community IPPE student pharmacists during an interprofessional older adult home visit. *Mary Beth O'Connell, Pharm.D.¹*, Shannon Jacobs, III, Pharm.D.², Lea Olson, III, Pharm.D.², Danielle Adams, III, Pharm.D.², Carol Bugdalski-Stutrud, B.S.Ph.², Jennifer Mendez, Ph.D.³, GERALYNN SMITH, M.S.², Cassandra Bowers, Ph.D.⁴; (1) Pharmacy Practice Department, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (2) Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (3) School of Medicine, Wayne State University, Detroit, MI; (4) School of Social Work, Wayne State University, Detroit, MI Presented at the American Pharmacists Association Annual Meeting & Exposition, Los Angeles, CA, March 1–4, 2013.

Geriatrics

22. Design and implementation of a high-risk medication decision support system for hospitalized geriatric patients. *Marketa Marvanova, PhD, Pharm.D., CGP¹*, Josh Peterson, MD, MPH², Sunil Kripalani, MD, MSc², Ionna Danciu, MS², Debbie Harrell, MS, DPh³, Carmen Rodriguez, BS², James Powers, MD²; (1) Pharmacy Practice Department, Chicago State University College of Pharmacy, Chicago, IL; (2) Vanderbilt University School of Medicine; (3) Vanderbilt University Medical Center **OBJECTIVES:** To develop a computerized decision support system (CDSS) to facilitate surveillance and clinical pharmacist intervention among geriatric inpatients administered high-risk medication regimens.

METHODS: The CDSS identified, in real-time, hospitalized geriatric patients (age ≥ 65 years old) in a 658-bed university hospital who have been prescribed at least one potentially inappropriate medication (PIM). The CDSS synthesizes and displays information about the prescription of up to 240 PIMs, as well as provides a score to quantify the anticholinergic burden, and the 48-hour cumulative narcotic and benzodiazepine doses. The CDSS also shows each patient's age, gender, estimated kidney function, complete list of diagnoses, names of the inpatient and outpatient physicians, and a link to the full electronic health record. Thus, the dashboard supports efficient review by a clinical pharmacist, who contacts the treating physician(s) when a change in therapy is recommended.

RESULTS: In the initial three-week pilot period, out of 797 patients CDSS flagged 179 patients (22%) and 485 patient-medication pairs for clinical review by the pharmacist. Seventy-one patient records with 134 patient-medication pairs required manual screening of the electronic medical record. Twelve patients receiving 40 PIMs orders were judged to warrant an educational intervention, which was delivered by telephone and text message. Providers indicated over 90% acceptability for personal contact

by the pharmacist, and completed 78% of recommended medication changes, with 40% PIMs stopped at discharge and 49% of PIMs used only during hospitalization.

CONCLUSION: We successfully developed a CDSS integrated into the electronic health record that allowed focused pharmacy review of medication appropriateness among vulnerable hospitalized geriatric patients. The pharmacist's time was greatly leveraged by this tool, the majority of recommended changes were made, and the intervention had a high degree of acceptability by providers.

23. Assessment of medication knowledge among geriatric patients at a community pharmacy setting. *Betül Okuyan, PhD¹*, *Ulku Duzgun, MSc¹*, Halil Ibrahim Arslan, Pharmacy Student², Sezgin Sap, Pharmacy Student², Irem Girgin, Pharmacist¹, Lale Elmas, MSc¹, Fikret V. Izzettin, Professor¹, Mesut Sancar, Associate Professor¹; (1) Clinical Pharmacy Department, Faculty of Pharmacy, Marmara University, Istanbul, Turkey; (2) Faculty of Pharmacy, Marmara University, Istanbul, Turkey

OBJECTIVES: The aim of the study is to assess medication knowledge among geriatric patients.

METHODS: This cross sectional study was conducted in community pharmacies during February–April 2012. Participations gave their consent after fully informed about the study. Patients were eligible for the study if they were taking at least four medications daily, were not receiving social care support for administration of their medication, and were older than 65 years old. Exclusion criteria were patients with cognitive or perceptual problems. The demographic data of patients were recorded through face-to-face interviews in the community pharmacy. The researchers selected geriatric patient's one drug by using random integer numbers to assess medication knowledge. Medication knowledge was assessed by applying questionnaire adapted from McPherson et al study (1). Drugs were classified according to the anatomical therapeutic chemical (ATC) classification system.

RESULTS: Of the 75 participants (mean of age: 71.11 ± 5.24 years old [range: 65–85]; 56.0% male), 54.7% had an optimal knowledge about their medication. The most frequently analyzed medications according to their ATC classification were cardiovascular system (38.6%), alimentary tract and metabolism (20.0%), nervous system (10.7%) and respiratory system (10.7%). The geriatric patients with low education level had worse medication knowledge than geriatric patients with high education level ($p < 0.05$).

CONCLUSION: It would be important to evaluate medication knowledge in geriatric patients to determine and solve medication related problems.

REFERENCES: 1. McPherson ML, Smith SW, Powers A, Zuckerman IH. Association between diabetes patients' knowledge about medications and their blood glucose control. *Res Social Adm Pharm* 2008; 4(1): 37–45.

24. Frequency of potentially inappropriate prescribing in a family medicine residency clinic. *Julie D. Adkison, Pharm.D., CDE¹*; (1) Memorial Family Medicine Residency Program, Sugar Land, TX

OBJECTIVES: It is well known that polypharmacy is common among elderly persons; however, many of these patients receive medications that have an increased risk of causing harm. The American Geriatrics Society released updated evidence-based Beers Criteria in 2012 to guide prescribing of potentially inappropriate medications (PIM). Our large family medicine residency center cares for a large population of elderly patients with a variety of chronic illnesses. The objective of this study was to gain information about our prescribing habits related to PIM among this population.

METHODS: We performed a cross-sectional retrospective data analysis of our elderly patients. This study was limited to 22 PIM defined by the 2012 Beers Criteria, independent of dose or duration of use. Nineteen of the drugs are categorized as drugs to avoid and three are to be used with caution. Patients age 65 and older, who had at least one office visit in the last 18 months were

included in the cohort (n=3363). Frequency of chronic disease occurrence was evaluated.

RESULTS: The mean age of the sample population was 75% and 59% were female. A total of 897 patients in the cohort (27%) were prescribed at least one PIM. Of these, 17% were prescribed two PIM and 4% were prescribed three or more. Five classes of medications account for 80% of the potentially inappropriate prescribing (non-steroidal anti-inflammatory drugs, other analgesics, benzodiazepines, oral antimuscarinics and sulfonylureas). The most common chronic diagnosis in our population is hypertension (74%), followed by hyperlipidemia (40%), osteoarthritis (29%), diabetes (29%) and depression (21%).

CONCLUSION: Use of inappropriate medications is common in our elderly population with multiple chronic diseases. We have gained valuable information which will be used to develop targeted educational programs aimed at decreasing the use of high-risk drugs in older adults.

Health Services Research

25. Impact of a surgery clinical pharmacist and an operating-room satellite pharmacy on adherence to antibiotic prophylaxis guidelines in oncologic surgery.

Shorouq A. Telfah, Pharm.D.¹, Manar Dirani, Pharm.D.², Lama H. Nazer, Pharm.D., BCPS¹, Faiez Daoud, MD²; (1) Department of Pharmacy, King Hussein Cancer Center, Amman, Jordan; (2) King Hussein Cancer Center, Amman, Jordan

OBJECTIVES: To evaluate the impact of a surgery clinical pharmacist and an operating room satellite pharmacy (ORSP) on adherence to antibiotic prophylaxis guidelines in oncologic surgery at a comprehensive cancer medical center.

METHODS: A pre- and post-intervention observational prospective study. The intervention consisted of assigning a full-time clinical pharmacist to the surgery service and implementing an ORSP. The clinical pharmacist worked with the surgeons to update the institutional antibiotic prophylaxis guidelines and to conduct educational sessions. In addition, the pharmacist reviewed the physicians' orders to ensure compliance and was available to address any questions. The ORSP ensured the timely delivery of the antibiotics and reviewed all orders. The medical records of adult cancer patients admitted for surgery were reviewed for 1 month during the pre-intervention phase in 2009 and 1 month after the full implementation of the intervention in 2012. The antibiotic prescribed and the dose was considered appropriate if they were consistent with the antimicrobial prophylaxis guidelines. Timing was appropriate if the antibiotic was administered within 60 minutes prior to skin incision. Duration of the antibiotic was appropriate if it did not exceed 24 hours after surgery. Adherence to the guidelines in the pre and post phases was compared using the Chi-square and Fisher exact test.

RESULTS: Seventy-seven patients were evaluated in the pre-intervention phase and 97 patients were evaluated in the post-intervention phase. The most common surgeries in both phases were breast, gastrointestinal, and genitourinary. Compared to pre-intervention, there was improvement in the post-intervention group in the appropriateness of the antibiotic prescribed and dose (56.3% vs 98.9%, p=0.00004), improvement in the timing of antibiotic administration (21.1% vs 83.2%, p < 0.0001), and improvement in the duration of prophylaxis (68.6% vs 99%, p < 0.0001).

CONCLUSION: Adherence to the antimicrobial prophylaxis guidelines improved significantly after introducing the surgery clinical pharmacist and the ORSP.

HIV/AIDS

26. Use of information technology to reduce antiretroviral medical errors in hospitalized patients. *Philip Chung, Pharm.D., MS¹, Yi Guo, Pharm.D.¹, Charles Abam, MS²; (1) Pharmacy, Montefiore Medical Center, Bronx, NY; (2) Emerging Health Information Technology, Montefiore Medical Center, Yonkers, NY*

OBJECTIVES: To determine the impact of using information technology related to computerized physician order entry (CPOE) system on antiretroviral (ARV) prescribing errors in a tertiary care setting.

METHODS: As a quality improvement project to reduce ARV prescribing errors in patients with HIV, a series of changes were made to our CPOE system on ARV prescribing along with prescriber and pharmacist education. The study retrospectively evaluated prescribing errors of ARV regimens of hospitalized patients during a 6-month period before (9/10–2/11) and after (9/11–2/12) implementation of CPOE changes. Errors were classified into one of three categories: contraindicated drug interactions, incomplete regimen, or incorrect dose/frequency. Pre-intervention (PRE) and post-intervention (POST) error rates were compared using Fisher's exact test and p < 0.05 was considered statistically significant.

RESULTS: A total of 153 and 176 patients were prescribed ARV during their hospitalization in PRE and POST, respectively. A significant reduction in overall prescribing errors was detected after implementation of CPOE changes (29% PRE vs 18% POST, p=0.03). The majority of errors in both periods were due to incorrect dose/frequency. However, a significant reduction of incorrect dose/frequency errors from 22% in PRE to 11% in POST (p=0.01) was observed. Errors in the remaining two categories remained relatively unchanged. Among the initially erroneous ARV regimens, 43% and 56% of regimens were corrected in PRE and POST, respectively. At the time of discharge, ARV regimens were without error in 92% of cases in POST compared to 84% in PRE (p=0.03).

CONCLUSION: Use of CPOE-based information technology, in conjunction with education, significantly reduced ARV prescribing errors in hospitalized patients. These interventions had a more pronounced effect on reducing dose/frequency errors as they primarily target errors in this area. Other strategies may be tried in the future to further reduce other types of ARV prescribing errors.

Infectious Diseases

27E. Utility of a clinical risk-factor scoring model in predicting infection with extended-spectrum β -lactamase (ESBL)-producing enterobacteriaceae upon hospital admission.

Steven Johnson, Pharm.D., BCPS¹, Deverick Anderson, MD, MPH², Richard Drew, Pharm.D., MS, BCPS, FCCP³, D. Byron May, Pharm.D., BCPS⁴; (1) Department of Pharmacy Practice, Campbell University, Winston-Salem, NC; (2) Duke University Medical Center, Durham, NC; (3) Duke University Hospital, Durham, NC; (4) Campbell University, Buies Creek, NC

Presented at Interscience Conference on Antimicrobial Agents and Chemotherapy, San Francisco, CA, September 9–12, 2012.

28. Evaluation of fidaxomicin use for *Clostridium difficile*-associated diarrhea.

Edward Eiland, III, Pharm.D., MBA¹; (1) Department of Pharmacy, Huntsville Hospital System, Huntsville, AL

OBJECTIVES: To determine clinical outcomes of fidaxomicin for the treatment of *Clostridium difficile*-associated diarrhea (CDAD) and corresponding clinical success, recurrence, and hospital readmissions.

METHODS: Single center, IRB-approved, retrospective analysis spanning 11 months. Hospitalized patients ≥ 18 years who received fidaxomicin, identified by charge data, for the treatment of CDAD were included. A CDAD diagnosis was made based upon clinical signs and symptoms as well as a positive polymerase chain reaction (PCR) test. Data was collected using electronic medical records.

RESULTS: The clinical success rate for the 30 recipients of fidaxomicin was 93.3% (28/30) while recurrence occurred in 13.3% (4/30) on days 12, 14, 18, and 33 post-treatment. All four patients with recurrence were readmitted to our hospital. Fidaxomicin was effective in limiting 30-day hospital readmissions of CDAD to

10% (3/30). Twenty-three percent (7/30) of patients received their entire fidaxomicin treatment course while hospitalized.

CONCLUSION: Real-world inpatient use of fidaxomicin within our hospital resulted in similar outcomes as described in the fidaxomicin Phase 3 clinical registry trials. Although the 13.3% recurrence rate presented here was in agreement with the 12.7% and 15.4% recurrence rates published in the two Phase 3 trials, it was expected to be higher for two reasons: Two-thirds of fidaxomicin use was in patients being treated for their 2nd or greater CDAD episode; 30% of fidaxomicin use was for patients with multiple recurrent CDAD (three or greater CDAD episodes within one calendar year), a population of patients not studied in Phase 3 trials. Published literature suggests the expected recurrence rate for patients that have previously had one recurrence is $\geq 45\%$. Patients were evaluated for up to 90 days post treatment for recurrence in this analysis yet all patients with a recurrence had symptoms within 60 days, whereas the Phase 3 trials followed patients for 30 days.

29E. In search of the optimal colistin dose: experience within a community health system. Joseph Pardo, Pharm.D.¹, Sandy Estrada, Pharm.D., BCPS², (1)Department of Pharmacy, Lee Memorial Health System, Fort Myers, FL; (2)Lee Memorial Health System, Fort Myers, FL
Presented at Presented at the American Society of Health System Pharmacists Midyear Clinical Meeting, Las Vegas, NV, December 2–6, 2012.

30. Influence of the non-invasive induced respiratory sample on antibiotic utilization in the treatment of lower respiratory tract infection. Lucas T. Schulz, Pharm.D., BCPS¹, John DiPoto, DPh-4², Anne Flaten, MBA, RRT², Barry C. Fox, MD³; (1)Department of Pharmacy, University of Wisconsin Hospital and Clinics, Madison, WI; (2)University of Wisconsin Hospitals and Clinics, Madison, WI; (3)University of Wisconsin School of Medicine and Public Health, Madison, WI

OBJECTIVES: The utility of an induced sputum Gram's stain and culture in the treatment of lower respiratory tract infection (LRTI) has not been evaluated.

METHODS: Respiratory-therapist-collected, hypertonic saline-induced sputum (RT-induced) samples obtained between 1/1/2010 and 8/1/2011 were assessed for efficacy, quality, and associated antibiotic utilization. Efficacy was defined as a procedure resulting in sputum production for lab analysis. Quality was defined as sputum production with Gram's stain result of ≥ 10 polymorphonuclear white blood cells per low power field (LPF) and <10 squamous epithelial cells per LPF. Antibiotic utilization was assessed on the day of sputum collection and 3 days afterwards. Pediatric patients and collection for AFB identification were excluded.

RESULTS: Over 19 months, 159 patients had induced sputum orders to evaluate LRTI. Induction was effective in 65.4% (n=104/159) cases. The microbiologically useful (quality) success rate of the effective sampling was 71% (n=74/104); a rate similar to expectorated samples. Thirty-nine patients were still hospitalized on day +3 and therefore, available for analysis of antibiotic utilization. Twenty-nine patients possessed a quality sample and were further analyzed. These patients saw a greater reduction in total antibiotics (0.97 vs 0.1 antibiotics, p=0.03), a greater reduction in the use of broad-spectrum antibiotics (0.9 vs 0.1, p=0.03), and decreased use of double gram-negative coverage with ciprofloxacin (p=0.003). The use of anti-MRSA agents between initiation and day +3 trended (p=0.0624) towards reduction. The use of enteral antibiotics between initiation and day +3 trended (p=0.0548) towards increased enteral utilization in the quality sample cohort.

CONCLUSION: Contrary to common belief, an RT-induced sputum collection frequently results in a quality sample. In patients with a quality sample, antibiotic utilization is improved. The RT-induced sputum sample may be an underutilized tool in appropriate antimicrobial stewardship.

Medication Safety

31. Assessment of enoxaparin anti-Xa activity and treatment efficacy's evaluation. Guy-Armel Bounda, B.Sc.(Pharm), M.Sc.(Clin. Pharm), PhD Candidate(Clin. Pharm)¹, Hao Zhi Hui, B.Sc., (Pharm), M.Sc., (Clin. Pharm)¹, Wei Hong, GE, B.Sc., (Pharm), M.Sc., (Clin. Pharm)², Feng Yu, B.Sc.(Med), M.Sc., PhD¹; (1)China Pharmaceutical University, Nanjing, China; (2)The Affiliated Drum Tower Hospital of Nanjing University Medical School, Nanjing, China

OBJECTIVES: Assessment of the safety and efficacy of enoxaparin anti-Xa activity in patient with normal renal function, unstable angina and non ST segment elevation myocardial.

METHODS: At its peak, 4 hours post Enoxaparin administration, blood samples were collected and anti-Xa activity was measured. The German Dade-Behring Corporation SysmexCA-7000 automated coagulation analyzer was used to measure the anti-Xa Enoxaparin activity. The clinical data of patient were evaluated to assess bleeding and thrombotic adverse events after treatment with Enoxaparin.

RESULTS: A total of 70 patients were eligible for our study, with a mean weight of 65.52 ± 9.97 kg (BMI: 18.02–29.24 kg/m²). While the minimum anti-Xa activity was 0.3 IU/mL, the maximum anti-Xa activity was 1.5 IU/mL, and the average anti-Xa activity was 0.62 ± 0.24 IU/mL. During the study, 5 (7.2%) patients had minor bleeding events with respective dosage of 0.9–1.2 IU/mL, which was below urinary occult blood positive rate in healthy adults (Adults 10.68%; Elderly 17.6%). There was no occurrence of thromboembolic event related to Enoxaparin use.

CONCLUSION: The Enoxaparin anti-Xa activity ≥ 0.3 IU/mL can be achieved when anticoagulant activity is effective with careful patient monitoring. During the treatment, there was no clinically significance of bleeding and thromboembolic events. These findings also show that enoxaparin dosing for the treatment of unstable angina and non ST segment elevation myocardial infarction can be safe and effective at an anti-Xa activity of 0.3–0.6 IU/mL.

32. Opioid use in internal medicine inpatients – how big of a problem? Sharan Lail, BScPhm¹, Kelly Sequeira, BScPhm¹, Jenny Lieu, BScPhm¹, Irfan Dhalla, MD, MSc¹; (1)St. Michael's Hospital, Toronto, ON, Canada

OBJECTIVES: Harms associated with prescription opioids are a major and increasing public health concern. Inpatient opioid prescribing may contribute to the problem especially if primary care practitioners continue opioid therapy initiated in hospital. We sought to describe the extent and nature of opioid prescribing in opioid-naïve patients on a general internal medicine (GIM) unit.

METHODS: Using a standardized data collection form, opioid-naïve patients admitted to the GIM unit over 12 weeks were prospectively followed to document the number, type and frequency of opioid prescriptions during their admission and upon discharge. Serious adverse events related to opioid use (e.g. administration of naloxone or falls) were also collected through chart review. Data were analyzed using descriptive statistics and chi-squared and t-tests where appropriate.

RESULTS: From July 4 to September 22, 2011, a total of 721 patients were admitted, of which 381 (53%) were classified as opioid naïve. Of the opioid naïve patients, 82 (22%) were prescribed opioids in hospital. There were a total of 246 opioid prescriptions, of which hydromorphone (110) and morphine (92) were most common. Patients prescribed opioids tended to be younger (average age 59 vs 68, p < 0.05) and had co-morbidities related to pain compared to those not prescribed opioids (67% vs 45%, p < 0.05). Twenty-three (28%) of the patients prescribed opioids in hospital were also prescribed opioids on discharge. The most commonly prescribed opioid on discharge was hydromorphone (39%). No patients were identified who experienced adverse events or death related to opioid use.

CONCLUSION: The proportion of opioid-naïve GIM patients prescribed opioids during hospital admission and at discharge

provide us with baseline rates that had not previously been described in the literature. Major adverse events were not observed in hospital. The predominance of hydromorphone prescriptions on discharge may be of concern in light of its potency and the potential for misuse.

Nephrology

33. Characteristics and outcomes of acute renal failure resulting in hospital admission in cancer patients. *Nour M. Alfaqeer, PharmD¹, Lama H. Nazer, PharmD, BCPS¹, Manar O. Sweiss, PharmD², Rana A. Aljaber, PharmD²;* (1)Department of Pharmacy, King Hussein Cancer Center, Amman, Jordan; (2)King Hussein Cancer Center, Amman, Jordan

OBJECTIVES: To describe the characteristics of cancer patients admitted with acute renal failure (ARF) and to describe the common causes and outcomes.

METHODS: This was a prospective observational study at a 170-bed comprehensive cancer center, conducted between December, 2011 and July, 2012. Patients admitted to the medical oncology service were screened within 24 hours to identify those with ARF upon admission. ARF was defined as the increase in serum creatinine (SCr) by 50% from baseline or urine output (UOP) <0.5 mL/kg/hour for more than 6 hours. The cases were reviewed by two clinicians to determine the cause of ARF and to confirm that ARF was a major cause of admission. Patient demographics, past medical and medication history were recorded. In addition, we evaluated resolution of ARF (return of SCr to 20% of baseline or improved UOP), ICU transfer, and mortality.

RESULTS: During the study period, 103 cases were identified, 57.3% were males; mean age was 64 years \pm 11.2 (SD), 24 patients (23.3%) had diabetes, and 55 patients (53.4%) had hypertension. The most common causes of ARF were dehydration, medications, and tumor-related, reported in 40 (38.8%), 34 (33%), and 23 (22.3%) of the cases, respectively. The most common medications associated with ARF were chemotherapy (n=14, 42%), mainly Cisplatin (78.6%), followed by non-steroidal anti-inflammatory drugs (n=13, 39%). Eleven patients (10.7%) progressed to chronic renal failure and three of those patients required hemodialysis. ICU transfer was required for four patients and death was reported in three patients. The remaining cases resolved and median time for resolution of ARF was 5 days \pm 3.73 (SD). There was no significant association between ARF resolution time and the cause of ARF.

CONCLUSION: The most common causes of ARF were dehydration and medications. Though the majority of the cases were reversible, this area needs to be further studied to determine its preventability.

Neurology

34. The clinical outcome of adjuvant therapy with black seed oil on intractable pediatric seizures: a pilot study. *Lamia Mohamed El Wakeel, PhD., Clinical Pharmacy¹, Rania Shatla, MD, PhD², May Shawki, Bsc Pharm³, Samira El Saeed, MD, PhD⁴, Samira Ismail, MD, PhD⁵, Osama A. Badary, PhD., Clinical Pharmacy⁶;* (1)Department of Clinical Pharmacy, Faculty of Pharmacy, Ain Shams University, Cairo, Egypt; (2)Department of Pediatrics, Faculty of Medicine, Ain Shams University, Cairo, Egypt; (3)Clinical Pharmacy Department, Faculty of Pharmacy, Ain Shams University, Cairo, Egypt; (4)Department of Medical Biochemistry, National research center, Cairo, Egypt; (5)Department of Clinical Genetics, National Research Center, Cairo, Egypt; (6)Faculty of Pharmacy, Ain shams University, Cairo, Egypt

OBJECTIVES: To evaluate the effect of black seed oil as add-on treatment to antiepileptic drugs (AEDs), on seizure frequency and severity and oxidative stress in patients with intractable epilepsy.

METHODS: A prospective randomized single-blinded crossover study. Thirty intractable epileptic children were randomly assigned to either Group I or II; Group I received placebo and AEDs (4 weeks) followed by a 2-week washout period (with

AEDs), then black seed oil and AEDs (4 weeks), Group II; received the same intervention with opposite order. Prior to allocation, all patients underwent a neurological assessment and evaluation of oxidative stress markers; total antioxidant capacity (TAC) and malondialdehyde (MDA). Patients were assessed at week 4 and 10 for the following: oxidative stress markers, seizure frequency and severity.

RESULTS: At baseline, both groups I and II had significantly lower serum TAC levels relative to healthy controls (p=0.007) while, MDA levels were not different. At the end of the study, there was a significant difference between the two periods in group I and a non-significant difference in Group II regarding seizure frequency and severity while there was no significant difference between the two periods in TAC and MDA in both groups. The effect of carryover was excluded.

CONCLUSION: Intractable epileptic children show evidence of oxidative stress. Administration of 40–80 mg/kg/day of black seed oil as add-on therapy did not alter neither oxidative stress markers nor seizure frequency or severity in intractable epileptic patients.

Pain Management/Analgesia

35E. Impact of a nurse-initiated, pharmacist-led acute pain management consultation service for medical inpatients. *Lee Stringer, Pharm.D.¹, Melanie Townsend, Pharm.D., BCPS², Kyle Townsend, Pharm.D., BCPS², Jeannine Brant, PhD, APRN, AOCN², Sharon Mulvehill, MD³, Tye Young, DO²;* (1)Department of Pharmacy, Billings Clinic, Billings, MT; (2)Billings Clinic, Billings, MT; (3)RiverStone Health, Billings, MT

Published in *Journal of Pain* 2012;13(4):S1. [without study results] Presented at Western States Conference, Monterey, CA, May 2–4 2012. [with study results] Presented at American Society of Health-Systems Pharmacists Midyear Clinical Meeting, New Orleans, LA.

Pediatrics

36. A retrospective evaluation of outcomes in newborns receiving calfactant or poractant alfa. *Jennifer Nieman, B.A., Pharm.D.¹, Ann Anderson-Berry, MD¹;* (1)Department of Pharmacy Relations & Clinical Decision Support, The Nebraska Medical Center, Omaha, NE

OBJECTIVES: To evaluate the occurrence of serious adverse events (occlusion of endotracheal tube, respiratory arrest, chest compressions, or extubation due to the above) upon administration of lung surfactant in patients who received calfactant or poractant alfa for treatment of neonatal respiratory distress syndrome

METHODS: This study is a retrospective medical records review of NICU patients requiring treatment for neonatal respiratory distress syndrome performed in a large academic medical center with a level 3c NICU. The Wilcoxon rank sum test was used to compare continuous data. Associations of categorical variables were assessed with the Fisher's exact test. A p-value of <0.05 was considered statistically significant.

RESULTS: Sixty-two patients received calfactant, a bovine-derived surfactant, between May 2008 and January 2011. Thirty-one patients received poractant alfa, a porcine-derived surfactant agent, between January 2011 and August 2011. No statistically significant differences were noted in baseline characteristics of the two groups, including sex, race, administration of maternal steroids, gestational age at birth, birth weight, and number of surfactant doses administered. The percent of patients experiencing a serious adverse event upon administration of the surfactant was higher, but not significant, in the calfactant group when compared to the poractant group (8% vs 0% p=0.165). Differences in other outcomes not found to be statistically significant include ventilator days, length of stay, reintubation, pulmonary hemorrhage, intraventricular hemorrhage, development of chronic lung disease, death. Develop-

ment of pneumothorax was higher in the poractant alfa group with borderline statistical significance (19% vs 5%, $p=0.06$).

CONCLUSION: Although a higher proportion of patients who received calfactant experienced a serious adverse event upon drug administration compared to patients who received poractant alfa, this difference was not statistically significant. These results should be confirmed in a larger study.

37. Risk of food allergy following antibiotic exposure in young children. *Bryan L. Love, Pharm.D., BCPS¹, Joshua R. Mann, MD, MPH², James W. Hardin, PhD³, David J. Amrol, MD²;* (1)South Carolina College of Pharmacy, Columbia, SC; (2)University of South Carolina School of Medicine, Columbia, SC; (3)University of South Carolina, Columbia, SC

OBJECTIVES: To assess the relationship between receipt of any systemic antibiotic within the first 12 months of life and the development of any food allergy in children through age 3. To determine if specific antibiotic drug classes are associated with the development of any food allergy in children through age 3.

METHODS: South Carolina Medicaid billing data for children born between 2007 and 2009 was obtained. Children with a diagnosis of FA before 12/31/2010 were identified as cases and matched 1:4 by birth year, sex, and race to controls without FA. Controls and cases were limited to children with uninterrupted Medicaid coverage during the first year of life. Logistic regression was used to estimate the odds of any diagnosis of FA.

RESULTS: A total of 1105 cases and 6433 controls were identified representing 8406 courses of antibiotics. Antibiotic prescriptions included penicillins (54%), cephalosporins (21%), macrolides (18%), and sulfonamide antibiotics (7%). When comparing cases and controls, the mean number of antibiotic courses was greater (2.65 vs 1.84, $p < 0.001$), and the mean time (days) to first antibiotic course was shorter (181.5 for and 190.1, $p=0.009$), respectively. Fewer controls received any antibiotic course (66% vs 77%; $p < 0.001$). Although exposure between days 0–182 was significant, the risk of FA was highest with exposure between days 183–365 (OR 1.98; 95% CI 1.61–2.42). The odds of FA increased proportionally with increasing courses of antibiotics (OR 1.10; 95% CI 1.07–1.13). Cephalosporins (OR 1.56; 95% CI 1.34–1.81) and sulfonamide antibiotics (OR 1.46; 95% CI 1.1–1.81) had the strongest association with FA development.

CONCLUSION: Antibiotic exposure in the first year of life is associated with an increased risk of FA and may be a causal factor. Multiple antibiotic courses significantly increase the risk. Cephalosporin and sulfonamide antibiotics confer a greater risk than penicillin and macrolide antibiotics.

38. Ceftriaxone safety in the pediatric population. *Martha Rumore, Pharm.D., J.D.¹;* (1)Department of Pharmacy, Cohen Children's Medical Center, New Hyde Park, NY

OBJECTIVES: Allergic reactions to ceftriaxone may occur in about 10% of patients receiving the drug. Anaphylactic reactions to cephalosporins are extremely rare but the rate (0.001–0.1%) is much higher than has been reported for penicillins. Additionally, patients with no known allergies to cephalosporins and/or penicillin may still have an allergic reaction to ceftriaxone. A contraindication and warning has been added to the labeling for ceftriaxone injection for neonates ≤ 28 days due to incompatibility with calcium-containing IV products and a cephalosporin class warning regarding the potential for immune mediated hemolytic anemia. Ceftriaxone also remains contraindicated in hyperbilirubinemic neonates, especially prematures due to the potential displacement of bilirubin from its binding to serum albumin, leading to possible risk of bilirubin encephalopathy.

METHODS: In our annual review of Adverse Drug Reactions (ADRs), ceftriaxone was responsible for more ADRs than any other agent; 17% (11/64). Nine ADRs involved itching, swelling, periorbital edema, hives, difficulty breathing and rash. Two ADRs involved cardiac arrest, necessitating interventions to sustain life (category 7 event classification). Both cases involved sickle cell anemia patients; in both instances, hemolytic anemia,

which can occur within minutes in pediatric patients, was ruled out.

RESULTS: After addressing these reactions in our multidisciplinary MedWatch Subcommittee, we restricted this agent in this patient population and have undertaken joint pharmacy/nursing education.

CONCLUSION: We located four published cases of anaphylaxis occurring with ceftriaxone after a single dose. Pediatric patients are at increased risk for ADRs from ceftriaxone. The intravenous dose should be given slowly over at least 30 minutes. Administration of ceftriaxone should be avoided for non-FDA approved indications. Avoid use for infections that could be treated by oral forms of effective antibiotics. In view of our cases, we use caution with use of this agent in pediatric sickle cell anemia patients.

Pharmacoeconomics/Outcomes

39. Diabetes and coronary artery disease: assessment of epidemiologic characteristics, treatment strategies, and evidence-based medicine use. *Bhavik Shah, M.Pharm, PhD(cont.)¹, Shrikalp Deshpande, DBM, MMS, LLB, PhD²;* (1)Department of Clinical Pharmacy, KB Institute of Pharmaceutical Education and Research ^{KBIPER}, Gandhinagar, India; (2)KB Institute of Pharmaceutical Education and Research ^{KBIPER}, Gandhinagar, India

OBJECTIVES: Evaluate and compare clinical and epidemiological characteristics treatment strategies, and utilization of key EBM among diabetic and non-diabetic patients with CAD.

METHODS: An observational study (conducted at tertiary care hospital from Jaipur (INDIA), Jan 2011–Jan 2012), among patients admitted in ICU, underwent coronary angiography (CAG), and diagnosed as CAD using standard definitions (acute coronary syndrome [ACS] i.e. myocardial infarction [MI], or unstable angina [UA]; or chronic stable angina [CSA]). The data included demographic information, vital signs, personal particulars, risk factors for CAD, treatment strategies, and medications prescribed at discharge. We assessed and compared epidemiologic characteristics and treatment strategies for diabetic and non-diabetic patients with CAD.

RESULTS: Of 1166 consecutive patients, 1073 underwent CAG, considered eligible: normal coronaries, 113 (10.5%); leaving 960 patients with CAD (MI [289, 30.1%], UA [604, 62.9%], Undetermined ACS [32, 3.3%], CSA [35, 3.7%]); 30% patients were diabetic. Proportion of hypertensive patients was significantly higher among diabetics (57.7% vs 34.9% non-diabetics, $p < 0.001$). No significant difference for proportion of patients on medical management (35.00% vs 34.43%, $p=0.091$). Surgical procedure (vs interventional strategy) more frequently preferred in diabetics (diabetic and non-diabetics patients: PTCA done/recommended, 42.69% and 48.86%, $p=0.0445$; CABG, 22.31% and 16.71%, $p=0.0230$, respectively). For ACS patients, key medications (antiplatelet agent, ACEI/ARB, BB, and anti-hyperlipidemic agent) were prescribed in 94.8%, 53.2%/12.3%, 66.7%, and 91.3% diabetic (252) and 96.0%, 51.4%/7.7%, 67.0%, and 93.9% non-diabetic (673) patients, respectively on discharge.

CONCLUSION: The worse prognosis in patients with CAD from India may be attributed to clustering of several cardiovascular risk factors at presentation. Though diabetics are being managed more conservatively, utilization of EBM for both diabetic and non-diabetic ACS is consistent with the guidelines and recommendations. This observational study might serve as a manoeuvre to the current practice and highlights the awareness on adherence to the recommendations from guidelines.

40E. A utilization review of intravenous immunoglobulin in a tertiary care hospital in United Arab Emirates. *Tasnim Dawoud, Pharm.D, BCPS¹;* (1)Pharmacy Department, Tawam Hospital, Al Ain, United Arab Emirates

Published in *Eur J Hosp Pharm* 2012;19:286–288 doi:10.1136/ejpharm-2012-000070.

41. Barriers to immunosuppressant adherence in community dwelling solid organ transplant recipients. *Jayashri Sankaranarayanan, M.Pharm., Ph.D.¹*, Dean Collier, Pharm.D., BCPS², Lynette Smith, M.S.³, Megan Keck, Pharm.D., BCPS², Tom Reardon, M.A.⁴, Alan N. Langnas, DO⁵; (1) Department of Pharmacy Practice, University of Nebraska Medical Center – College of Pharmacy, Omaha, NE; (2) College of Pharmacy, University of Nebraska Medical Center, Omaha, NE; (3) Department of Biostatistics, College of Public Health, University of Nebraska Medical Center, Omaha, NE; (4) Information and Technology Services, University of Nebraska Medical Center, Omaha, NE; (5) College of Medicine, University of Nebraska Medical Center, Omaha, NE

OBJECTIVES: To evaluate perceived barriers to immunosuppressant-adherence in community dwelling adult solid organ transplant recipients (SOTRs) because such data in the United States (US) is limited.

METHODS: For this retrospective study, cross-sectional self-reported survey data (demographic; medical – condition, immunosuppressant -therapy, adherence (4-item Immunosuppressant Therapy Adherence Scale, ITAS) and adherence barriers (13-item Immunosuppressant Therapy Barriers Scale, ITBS)) received from ≥ 19-year old adult SOTRs were merged with other data from a Midwestern US academic transplant center's database. ITBS scale dimensionality, reliability, and criterion-related validity were assessed using principal components analysis, Cronbach's alpha coefficient of internal consistency, and by relating subscale scores to ITAS, respectively. To assess the scale's nomological validity, multivariate logistic-regression analyses were used to determine significant SOTR-characteristics associated with high vs low barriers on ITBS (entire scale, subscales; uncontrollable, controllable).

RESULTS: The survey response rate was 30% (n=554/1827; kidney (48%), liver (47.5%), other (4.5%) transplant). The 13-item ITBS scale (with a two-factor structure), including three-item "uncontrollable" and 10-item "controllable" subscales showed acceptable reliabilities of Cronbach's alpha coefficients 0.91, 0.75, 0.89, respectively. In multivariate analyses, SOTRs with high adherence barriers on ITBS subscales and entire scale were significantly less likely to self-report high adherence on ITAS ($p < 0.0001$). Lower health status, age 19–64 years, early transplant years, being on cyclosporine or cyclosporine combinations vs Tacrolimus alone significantly correlated with high barriers on the entire ITBS scale ($p < 0.05$). Patients with college or more vs high school or less education reported high adherence barriers on ITBS's "controllable" subscale. Males and 19–34 year olds significantly reported high barriers while liver vs kidney transplant recipients reported low barriers on ITBS's "uncontrollable" subscale ($p < 0.05$).

CONCLUSION: High immunosuppressant-adherence barriers in males, the young, SOTRs with poor health status, early post-transplant years, when on cyclosporine or cyclosporine combinations, and depending on the type of transplant warrant providers' attention.

Pharmacoepidemiology

42. Elderly drug utilization in the community assessed through pharmacy dispensing data. *Alina de las Mercedes Martinez Sanchez, Ph.D.¹*; (1) La Rioja International University, Spain

OBJECTIVES: To characterize the use of drugs by the elderly through dispensing data at the community pharmacy level. This study was conducted at a community pharmacy in Madrid, Spain in 2011.

METHODS: A retrospective and descriptive consumption study was conducted using computerized pharmacy dispensing records for all pensioner patients. The Anatomical Therapeutic Chemical (ATC) Classification System code of all drugs dispensed is recorded in this database and, accordingly, this classification was used. The 10 most widely used ATC subgroups (2nd level) were determined. These most widely used ATC subgroups were examined using ATC codes of the 5th level, allowing estimation of commonly consumed drugs.

RESULTS: A total of 40,177 drugs were dispensed as prescriptions to patients who were pensioners. Anti-inflammatory drugs and analgesics were by far the most widely used drugs: 37.2% of all elderly used drugs from this subgroup. The use of drugs from the remaining nine subgroups was considerably lower, ranging from 9.0% (drugs for obstructive airway diseases) to 4.5% (anti-neoplastic and beta blocking agents). Cardiovascular system drugs and psycholeptics were used by 7.8%. Diuretics were used by 7.5% of the elderly while antibacterials for systemic use and psychoanaleptics were used by 5.6%. The psychoanaleptics were mostly represented by venlafaxine and citalopram.

CONCLUSIONS: According to the dispensing data, drug use in this sample is similar to that reported by other studies conducted in Spain and abroad. The majority of the elderly were exposed to anti-inflammatory drugs, analgesics, and drugs for obstructive airway diseases. Other ATC subgroups for treatment of cardiovascular conditions were used. This study demonstrates the need for involvement of pharmacists to ensure efficacy and safety in the use of drugs by sensitive populations such as the elderly in the community setting.

43E. Adequate pediatric fluoride prescribing practices at an urban community health center. *Amaris Rodriguez, PharmD Candidate 2013¹*, Michelle Wong, PharmD Candidate 2013², David Sherman, PharmD Candidate 2013², Matthew Silva, PharmD³; (1) School of Pharmacy, Massachusetts College of Pharmacy and Health Sciences, Worcester, MA; (2) Massachusetts College of Pharmacy and Health Sciences, Worcester, MA; (3) MCPHS University, Worcester, MA

Presented at Presented at the American Society of Health System Pharmacists Midyear in Vegas, NV on December 10, 2012.

Pharmacogenomics/Pharmacogenetics

44. What factors are associated with the development of myalgia in patients newly initiating statin therapy? An evaluation of clinical and genetic variables in the additional KIF6 risk offers better adherence to statins (AKROBATS) trial. *Scott Charland, PharmD¹*, H. Robert Superko, MD¹, Barnabie Agatep, MPH¹, Miriam Ryzkin, MS¹, Vivian Herrera, DDS, MPH, MIA¹, Bruce Schrader, PharmD¹, Junaid Shabbeer, PhD¹, James Devlin, PhD¹, Eric Stanek, PharmD¹; (1) Mountain Solutions, Winter Park, CO

OBJECTIVES: To determine the association and relative importance of clinical and genetic factors associated with myalgia (muscle pain, weakness, or fatigue) in subjects prescribed a statin.

METHODS: The population consisted of 647 subjects new to statin therapy enrolled in the AKROBATS trial. Multiple clinical factors were assessed, including genotypes (*KIF6*, *SLCO1B1*5*, and *COQ2*) and a myalgia questionnaire (baseline and 6-month) with two domains: Myalgia Symptoms (MyS) and Myalgia Impact on Activities of Daily Living (MyI-ADL). Incident myalgia was defined as an increase in MyS score from baseline. Categorical and continuous variables were analyzed using chi-squared and t-tests, respectively (significance, $p < 0.05$) and association with incident myalgia by multivariate regression.

RESULTS: Subjects were 60 ± 12 years old, female (54.4%), Caucasian (90.7%), prescribed simvastatin (43.3%, mean 32.5 ± 18.6 mg/day), and obese (BMI 30.5 ± 6.8 kg/m²). At baseline, 36.9% of subjects reported myalgia (MyS score >0) and 16.7% indicated that myalgia their ADLs (MyI-ADL score >0). At 6 months, incident myalgia was 24.9%, and 14.1% reported worsened MyI-ADL scores. Myalgia incidence and MyI-ADL were not associated with carrier status: *KIF6* [odds ratio; OR 1.3 (95% CI 0.84–2.02)], *SLCO1B1*5* [OR 1.02 (95% CI 0.47–2.21)], or *COQ2* [OR 1.14 (95% CI 0.69–1.90)]. Incident myalgia was inversely associated with baseline MyS and MyI-ADL (scores = 0) [odds ratio; OR 0.44 (95% CI 0.26–0.74), $p < 0.001$ and OR 0.46 (0.22–1.00), $p=0.05$, respectively], and increasing MyI-ADL scores per unit increment in score (OR 9.20 (5.15–16.48), $p < 0.001$).

CONCLUSION: The 6-month incidence of myalgia in patients new to statins in this study was 25%. Myalgia negatively

impacted ADL performance, and was not associated with the genetic markers assayed. Assessing baseline myalgia (presence and severity) is important when monitoring statin tolerability, as these appear to be key clinical determinants of new-onset myalgia.

45. Endothelial nitric oxide synthetase genetic variants, metabolic syndrome and endothelial function in schizophrenia. Kyle Burghardt, Pharm.D.¹, Tyler Grove, B.S.¹, Vicki Ellingrod, Pharm.D., FCCP¹; (1)Department of Clinical, Social and Administrative Sciences, University of Michigan College of Pharmacy, Ann Arbor, MI

OBJECTIVES: Increasing rates of metabolic syndrome and cardiovascular disease in schizophrenia has led to investigation into their causes including atypical antipsychotics and pharmacogenetics variants. This study focuses on the peripheral vasculature as a cardiovascular phenotype and the influence of atypical antipsychotics, the aberrant metabolism of nitric oxide caused by endothelial nitric oxide synthetase (*eNOS*) genetic variants and metabolic syndrome in a cross-sectional sample of schizophrenia subjects.

METHODS: Associations between *eNOS* variants (the *eNOS* T⁻⁷⁸⁶C and Glu298Asp variants) and endothelial function was assessed in a cross sectional cohort of schizophrenia patients taking antipsychotics, undergoing a clinical assessment for endothelial functioning (using peripheral artery tonometry via the EndoPAT2000 device, RH-PAT) as well as metabolic syndrome screening. ANOVA and regression analysis were conducted on the entire cohort then again after stratifying by metabolic syndrome to investigate the effect of the *eNOS* variants and metabolic syndrome on RH-PAT values.

RESULTS: The study included 203 subjects with a mean age of 46 ± 11.5 years. The cohort was 36% female, 36% met metabolic syndrome criteria and 85% were currently using atypical antipsychotics. In schizophrenia patients without metabolic syndrome, RH-PAT values were significantly affected by smoking (p=0.02) and antipsychotic exposure (p=0.01) Associations between *eNOS* T⁻⁷⁸⁶C and better RH-PAT values were found only in schizophrenia patients without metabolic syndrome (p=0.02) when controlling for race, antipsychotic exposure and smoking (as these were found to affect RH-PAT values or genotype distribution). No associations were found for the Glu298Asp variant.

CONCLUSION: Our results suggest that when schizophrenia patients progress to meet metabolic syndrome criteria, the genetic protection of the *eNOS* T⁻⁷⁸⁶C variant on endothelial function is no longer seen and other factors of this pro-inflammatory state may be overriding this protection. The results of this study need replication and the factors driving endothelial dysfunction in patients with metabolic syndrome warrant further investigation.

Pharmacokinetics/Pharmacodynamics/Drug

46E. Vancomycin pharmacokinetics and dosage requirements in pediatric cancer patients. Ola Abdel Hadi, PharmD¹, Lama H. Nazer, PharmD, BCPS², Suha Al Omar, PharmD³, Jennifer Le, PharmD, BCPS-ID⁴, Edmund Capparelli, Pharm.D.⁵; (1)Novartis, Amman, Jordan; (2)Pharmacy Department, King Hussein Cancer Center, Amman, Jordan; (3)King Hussein Cancer Center, Amman, Jordan; (4)Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, CA; (5)Pediatric Pharmacology Research Unit, University of California at San Diego, La Jolla, CA
Presented at Jordanian Society of pediatric oncology (JSPO) conference.

47. Model – based optimization of daptomycin dosing during high-intensity renal replacement therapy. Andras Farkas, Pharm.D.¹; (1)Department of Pharmacy, Nyack Hospital, Nyack, NY
OBJECTIVES: Daily intermittent hemodialysis (IHD) may be used to treat patients when the target dose of renal replacement therapy (RRT) cannot be provided with conventional IHD. The

objective of this study was to establish the optimal dosing regimen of Daptomycin (DAP) during daily IHD.

METHODS: Population pharmacokinetic (popPK) model of DAP in IHD patients was used in this analysis. Doses of 2–4 mg/kg given 1 hour prior, 1 hour into, and 1 hour before the end of dialysis were evaluated with Monte Carlo Simulation (MCS, n=10000) daily 2, 3, 4, and 5 hour IHD sessions. To select the optimal regimen, the simulated mean + SD trough levels at 72 hours and AUC_{48–72 hours} in dialysis were compared with the mean + SD trough levels at 72 hours and AUC_{48–72 hours} for the dose of 6 mg/kg every 24 hours using the popPK model developed in the bacteremia trial.

RESULTS: About 6 mg/kg DAP regimens should result in mean + SD trough levels and AUC_{48–72 hours} values of 9.5 + 8.1 µg/mL, and 441.1 + 275 mg/h/L, respectively. To achieve similar exposure during daily IHD, 3 mg/kg for 2 and 3 hours sessions, while up to 4 mg/kg for 4 and 5 hour sessions should be given every 24 hours, especially when the dose is given 1 hour prior or 1 hour into dialysis. These dosage regimens may also produce an up to 64% increase in the expected mean trough levels.

CONCLUSION: We conclude that the DAP dosing strategies presented here would provide adequate coverage in daily IHD, as compared to the exposure achieved by the patients in the bacteremia trial. The increase in the expected trough levels should also be considered when evaluating the probability of drug related adverse events.

48. Site – specific target attainment rates of meropenem for central nervous system infections. Andras Farkas, Pharm.D.¹; (1)Department of Pharmacy, Nyack Hospital, Nyack, NY

OBJECTIVES: Meropenem (MER) is a broad spectrum carbapenem antibiotic often used in the empirical treatment of nosocomial CNS infections. The objective of this study was to describe the effects of prolonging the infusion time on the Probability of Target Attainment (PTA) of MER at doubling MIC dilutions based on total cerebrospinal fluid (CSF) levels.

METHODS: Population pharmacokinetic (n=10) model for MER in patients with external ventriculostomies was used in this analysis. The standard dose of 2 g MER every 8 hours was evaluated for PTA with Monte Carlo simulation (MCS, n=5000) using 0.5 and 4 hours infusion times at the MIC ranges of 0.0625–2 mg/L and for the 100% T>MIC target.

RESULTS: Based on total CSF levels of MER in patients with non-inflamed meninges, the standard dose of 2 g MER infused over 0.5 hour is expected to achieve PTAs of >90% up to an MIC of 0.0625 mg/L. When MER is infused over 4 hours, similar rates of target attainment success can be expected up to an MIC of 0.125 mg/L. Both infusion strategies showed PTAs less than 90% at the MIC of 0.25 mg/L or higher. Extending the infusion time resulted in an increase of the PTAs of 5 %, 7 %, 7 %, 4%, and 1 % at the MICs of 0.125, 0.25, 0.5, 1, and 2 mg/L, respectively

CONCLUSION: We conclude that at the target of 100% T>MIC, prolonging the infusion of MER from 0.5 to 4 hours would have minimal effects on the PTAs based on simulated CSF levels. Instead, the use of alternative agent for the treatment of organisms with higher MICs should be considered.

49. Pulmonary target attainment rates of short and extended infusion meropenem regimens based on simulated epithelial lining fluid levels. Andras Farkas, PharmD¹; (1)Department of Pharmacy, Nyack Hospital, Nyack, NY

OBJECTIVES: Meropenem (MER) is a broad spectrum carbapenem antibiotic frequently used in the treatment of gram negative pneumonias. The objective of this study was to describe the effects of prolonging the infusion time on the Probability of Target Attainment (PTA) of MER based on total epithelial lining fluid (ELF) levels.

METHODS: Population pharmacokinetic (n=39) model for MER in patients with ventilator associated pneumonia was used in this

analysis. Doses of 0.5–2 g every 6 and 8 hours were evaluated with Monte Carlo simulation using 0.5 and 4 hours infusion times for the target of 40% $fT > MIC$.

RESULTS: Based on ELF levels, all regimens showed PTAs of less than 90 % at the MIC of greater than 1 mg/L. When MER is infused over 4 hours, an increase of up to 20 % in PTAs can be expected at each MIC dilution, as compared to the short infusion times. The PTAs of short infusion 1 g every 6 hours and 2 g every 8 hours are 92/89%, 89/86%, 85/82%, 78/76%, and 69/70%, at the MICs of 0.0625, 0.125, 0.25, 0.5, and 1 mg/L, respectively. At the same MICs, the short infusion 0.5 g every 6 hours and 1 g every 8 hours regimens are expected to achieve PTAs of 89/86%, 85/82%, 78/76%, 69/70% and 58/60%, respectively.

CONCLUSION: We conclude that at the target of 40% $fT > MIC$, prolonging the infusion of MER from 0.5 to 4 hours would have modest effects on the PTAs based on ELF levels. In addition, our analysis also confirms similar target attainment rates at the site of infection for dosing strategies that employ a 50% reduction in the dose to be administered as a short infusion time at more frequent intervals.

Psychiatry

50E. Second generation antipsychotics and metabolic abnormalities: evaluating risk factors in schizophrenia. *Maria M. Thurston, Pharm.D., BCPS¹*, Erica J. Duncan, M.D.²; (1)Pharmacy Practice, Mercer University College of Pharmacy and Health Sciences, Atlanta, GA; (2)Atlanta Veterans Affairs Medical Center/Emory University School of Medicine, Decatur, GA
Presented at The Society of Biological Psychiatry 68th Annual Scientific Convention, San Francisco, CA, May 16–18, 2013.

Urology

51E. Selective serotonin reuptake inhibitor use and intraoperative bleeding in urologic surgery. *Rebecca Rosenwasser, Pharm.D.¹*, Bradley Stein, Pharm.D.²; (1)James A. Haley Veterans' Hospital, Tampa, FL
Presented at Midyear Clinical Meeting of the American Society of Health-System Pharmacists, New Orleans, LA, December 4–8, 2011.

Women's Health

52E. Comparative effects of nebivolol and metoprolol on female sexual function. *Rebecca Rosenwasser, Pharm.D.¹*, Nancy Borja-Hart, Pharm.D.¹, Anil George, M.D.¹, Benjamin J. Epstein, Pharm.D.²; (1)East Coast Institute for Research, Jacksonville, FL; (2)University of Florida, Gainesville, FL
Presented at Presented at the Midyear Clinical Meeting of the American Society of Health-System Pharmacists, Las Vegas, NV, December 2–6, 2012.

53. Barriers to intrauterine device use at a University-based women's clinic. *Denise Ragland, PharmD¹*, Nalin Payakachat, PhD¹, Nafisa Dajani, MD¹; (1)University of Arkansas for Medical Sciences, Little Rock, AR

OBJECTIVES: The purpose of this study was to determine the barriers to intrauterine device (IUD) use at a university-based women's clinic.

METHODS: The Institutional Review Board approved this cross-sectional survey of a convenience sample of subjects receiving obstetrical care at a university-based women's clinic. Eligible women who consented to participate self-administered a 16-question survey during a routine prenatal visit. Descriptive statistics were used to report participants' demographics and history of contraception use. Additionally, subjects were asked if they would consider IUD use in the future.

RESULTS: A total of 160 women participated in this study. The average age of this sample was 24.9 (SD = 6.3). The majority

were in low income and low education categories. Only 5% (N=9) of women reported previous IUD use. Twenty-six percent (N=45) desired more information regarding IUD contraception. Additionally, 18.5% (N=31) of women surveyed would consider using an IUD in the future and 25% (n=40) would consider IUD in the future if they knew more about them. Insurance and financial constraints were cited as barriers to IUD use. Four percent of women reported that they had used an IUD previously and were unhappy with it due to pain and discomfort. Eighteen percent (n=30) would not consider an IUD because they had heard about side effects. Sixty-eight percent of the surveyed sample reported unintended pregnancies.

CONCLUSIONS: The two most common barriers to IUD use in this patient population was lack of knowledge and financial constraints. By educating patients and increasing their awareness of efficacy and advantages of IUDs, IUD usage could become more prevalent. In addition, IUD use has greater efficacy than oral contraceptives thus potentially reducing the unintended pregnancy rate in this clinic population.

CLINICAL PHARMACY FORUM

Adult Medicine

54. Assessing the validity of community acquired pneumonia hospital admissions. *Sharon See, Pharm.D.¹*, Leslie Hsiung, MD², Stacey De-Lin, MD², Marika Alois, MD², James Mumford, MD³, Yvette Schluskel, PhD³; (1)Clinical Pharmacy Practice Department, St. John's University College of Pharmacy and Health Sciences, Jamaica, NY; (2)Beth Israel Medical Center, New York, NY; (3)Institute for Family Health, New York, NY

OBJECTIVES: The CURB-65 score is a severity assessment of community acquired pneumonia (CAP) based on five factors: Confusion, Urea (blood urea nitrogen) >7 mM or 20 mg/dL, Respiratory rate >30 breaths/minute, Blood pressure, systolic <90 mmHg or diastolic <60 mmHg, Age >65 years. Scores >2 justify hospitalization. The objective of this study was to evaluate CAP patients at the time of admission to determine adherence to CURB-65 criteria and identify other risk factors that contributed to the decision for inpatient admission. Other objectives included identification of complications that occurred in patients with CURB scores <2 and length of stay information.

METHODS: This was a retrospective chart review of 72 Family Medicine inpatients over the age of 18 years admitted for CAP at Beth Israel Medical Center during the period from January 1, 2009 to December 31, 2011.

RESULTS: An initial search in our FileMaker Pro database identified 173 patients with a diagnosis of CAP for this time period. Ninety-two patients were eligible based on inclusion/exclusion criteria but only 72 had sufficient data to permit analysis. Two-thirds of the patients who were admitted did not fulfill CURB 65 admission requirements. There were no significant reasons for admitting patients with CURB scores <2. Complications developed during stay were minor and not significantly different between groups. Patients with CURB scores <2 had an average length of stay of 5 days and were, on average, younger (65 vs 75, respectively).

CONCLUSION: Most CAP patients admitted to our hospital could have been treated as outpatients according to CURB 65 criteria.

Ambulatory Care

55. Retrospective evaluation of pharmacist involvement in a medical home. *Jennifer D'Souza, PharmD, CDE, BC-ADM¹*, Jaini Patel, PharmD, BCACP¹, Jill S. Borchert, PharmD, BCPS, FCCP¹; (1)Dreyer Medical Clinic & Midwestern University Chicago College of Pharmacy, Downers Grove, IL

OBJECTIVES: In January 2012, a patient-centered medical home (MH) model was implemented in a multi-specialty group practice in suburban Chicago. While the MH model involves team decisions of care, each practitioner contributes to documentation of

the visit. The pharmacist may be involved in medication reconciliation, selection, monitoring, and education on medications and/or adherence. The objective of this study is to characterize the contributions of the pharmacist as a part of the MH model.

METHODS: Through a retrospective electronic medical record (EMR) review, MH patient visits were evaluated to identify interventions made by the pharmacist. Patients enrolled in the MH were identified and EMR was reviewed for visits from January 1, 2012 to August 1, 2012. The charts were reviewed for demographics, number of visits including a pharmacist, interventions by the pharmacists, and the rationale for these interventions. Descriptive statistics were used to summarize demographics and report on the types of activities.

RESULTS: Ninety-three patients were identified as being enrolled in the MH since implementation in January 2012. Mean age was 59.7 ± 16.6 years with approximately three-fourths (74.2%, n=69) being female. As of August 2012, 47 of these patients had an initial visit already in the MH, of which 19.1% (n=9) did not meet with a pharmacist. Of the patients without an initial visit, 56.5% (n=26) of the patients had a PCP visit outside of the MH model. Interventions made by the pharmacists (n=122) included medication education (43.4%), optimizing drug selection (19.7%), medication monitoring (18%), optimizing dosage regimen (11.5%), and adherence counseling (7.4%). The most common rationales for these interventions were therapeutic evidence (31.1%), lack of therapeutic response (22.2%), and adherence (20%).

CONCLUSION: Collaboration in the MH allowed pharmacists to provide education and optimize drug selection and monitoring. Barriers to including the pharmacist in each patient visit should be explored.

56. Current pharmacist involvement in the patient-centered medical home (PCMH): a survey of ACCP members. *CoraLynn B. Trewet, MS, PharmD¹, Helen Berlie, PharmD², Robert DeYoung, PharmD³, Craig D. Logemann, Pharm.D.⁴, Jonathan Ference, PharmD⁵, Erica F. Pearce, PharmD⁶, Katy Pincus, PharmD⁷, Candice L. Garwood, PharmD⁸, Christie Schumacher, PharmD, BCPS, BC-ADM, CDE⁹;* (1)University of Iowa College of Pharmacy, Des Moines, IA; (2)Wayne State University, Detroit, MI; (3)Advantage Health Physician Network, Grand Rapids, MI; (4)Iowa Health Physicians and Clinics, Des Moines, IA; (5)Wilkes University Nesbitt College of Pharmacy & Nursing, Wilkes, Barre, PA; (6)St. Louis College of Pharmacy, St. Louis, MO; (7)University of Maryland School of Pharmacy, Baltimore, MD; (8)Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (9)Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL

OBJECTIVES: The current health care system in the U.S. is fragmented and inefficient. Primary care practice models are evolving to address this problem. Leading this evolution is the patient-centered medical home (PCMH). The pharmacy profession must be ready to implement clinical pharmacy services within the PCMH. This poster briefly discusses the current state of the PCMH and the role of pharmacists in the current PCMH model.

METHODS: A 14-item survey to assess the current state of the PCMH in ACCP member's practice sites was completed in August 2012. All ACCP members received a request to complete the electronic survey and a total of 330 members responded.

RESULTS: The majority of respondents' practice sites were within family or internal medicine offices (46.1%) with most affiliated with a school or college of pharmacy (85.2%). PCMH certification is held by nearly half (44.6%) of the respondent sites; most holding level 3 NCQA certification. Pharmacists held a variety of different roles within the PCMH. The majority of respondents reported their current level of involvement as frequent activity for collaborative drug therapy management (70.8%) and medication reconciliation (62.6%). Pharmacists were divided on compensation with over half (56.1%) not pursuing reimbursement for cognitive services. Pharmacists saw their own efforts have an impact with improved patient satisfaction (48.8%), provider satisfaction

(48.8%) and surrogate disease markers such as LDL and A1c (43.7%). Fewer pharmacists responded to their efforts decreasing hospitalizations (18.6%) and readmissions (20.5%).

CONCLUSION: There have been important steps made through the involvement of pharmacists in the PCMH to optimize patient outcomes. The summary of responses represents a snapshot in time of where pharmacists are with implementation of the PCMH model in their practice sites and medical neighborhoods.

57. Quality improvement initiative: development of hypertension pager program to improve blood pressure management in veterans. *Jancy Killian, PharmD¹, Angela Porter, PharmD², Beth Greck, PharmD¹;* (1)Charles George VAMC, Asheville, NC; (2)Charles George Veterans Affairs Medical Center, Asheville, NC

OBJECTIVES: Over half of US adults over the age of 55 have high blood pressure. Of those people with high blood pressure less than half have it controlled. Several studies have assessed the use of pharmacists for improving hypertension among the veteran populations. The Hypertension Pager Program was developed as a quality improvement initiative to improve management of veterans' blood pressure using Clinical Pharmacy Specialists.

METHODS: When a patient presents for an outpatient specialty medical appointment, blood pressure (BP) and other vitals are taken by the intake nurse. If BP is elevated >140/90 mm Hg (including a repeat manual reading), the nurse completes a form in the electronic medical record and follows an algorithm to page the hypertension pager if indicated. The assigned clinical pharmacy specialist responds to the page, which often results in a face-to-face encounter with the patient. The Clinical Pharmacy Specialist makes an assessment of BP goals, medications, compliance, often provides education, and finally develops a treatment plan with appropriate follow-up.

RESULTS: Charts (n=306) were reviewed from April 2010 through April 2011. Of the 278 patients seen, the average blood pressure was 156/95 mm Hg. At the first encounter, medication was initiated in 36 (13%) patients and medications were adjusted or restarted in 64 (24%) patients. Two-hundred forty nine patients (93%) were instructed to self-monitor prior to their next appointment. Approximately 50% of the patients had follow-up for hypertension. Of those 147 patients, 22% had a new antihypertensive medication started and 26% had a medication adjusted. Sixty-five percent of patients who had follow-up data achieved their goal blood pressure.

CONCLUSION: The implementation of the Hypertension Pager Program has shown an improvement in overall blood pressure management for veterans at the outpatient specialty medical clinics at this facility.

58. MedIntegrate: using reimbursed services of community pharmacists to accomplish medication reconciliation in an ambulatory clinic. *Marko Tomas, BScPhm¹, Lisa McCarthy, BScPhm, PharmD, MSc², Natalie Crown, BScPharm, PharmD², Debaroti Borschel, MD, MSc¹;* (1)Women's College Hospital, Toronto, ON, Canada; (2)Women's College Hospital and University of Toronto, Toronto, ON, Canada

OBJECTIVES: Medication reconciliation is associated with a reduction in unintended discrepancies and adverse events. Many argue that the process is more challenging to accomplish in ambulatory care settings due to increased onus on the patient for medication use, periodic prescriber contact, and communication challenges between multiple healthcare providers. In the province of Ontario, Canada, medication reconciliation is a government-funded service for which community pharmacies can be compensated (MedsCheck). Our goal is to leverage this community based program to improve hospital based ambulatory care.

METHODS: The MedIntegrate program is a pharmacist-led initiative within the Complex Care Clinic, a referral-based internal medicine clinic, at Women's College Hospital. The program involves a two-pronged outreach strategy: (1) during the telephone booking of their initial clinic appointment, patients on three or more medications are asked to schedule a consultation

with their community pharmacist to obtain a best possible medication history (BPMH), (2) community pharmacists are contacted by fax with a request to complete and return a BPMH before the patient's appointment. Community pharmacists are also asked to include any actual or potential drug-therapy problems identified during the MedsCheck, so that clinic pharmacists and the inter-professional team can follow-up. The BPMH is used as a starting point for medication reconciliation, provides the team with a complete medication history, and aids clinic pharmacists in identifying patients who require further review.

RESULTS: The program is being trialed over 12 weeks in early 2013 and is expected to impact the care of approximately 300 patients over this time.

CONCLUSION: Evaluation of the program is currently ongoing and will explore; pharmacy response rates, patient and medical resident perceptions of the utility of the program, perceived barriers, and workload of administrative staff.

59. Pharmacist roles in an international medical brigade setting. *Nicholas Leon, Pharm.D., BCPS, BCACP¹, Caitlin Brown, Pharm.D. Candidate 2015¹, Brianna Carbo, Pharm.D. Candidate 2015¹, Kristin Finno, Pharm.D. Candidate 2015¹, Anna Marie Morlino, Pharm.D. Candidate 2015¹;* (1) Jefferson School of Pharmacy, Thomas Jefferson University, Philadelphia, PA

OBJECTIVES: Provision of quality, sustainable, medical care in rural communities of developing countries remains an enormous challenge. The role of pharmacists in helping to meet this challenge has not been well described. We aim to describe the roles of pharmacists working in a mobile "medical brigade" setting when serving rural communities in Honduras.

METHODS: Every 3–4 months rural communities in Honduras, working with a non-profit organization, host a medical brigade. Before traveling to Honduras, a pharmacist working specifically with student volunteers (undergraduate, graduate and student pharmacists) must help create a medication formulary and assist in the procurement of medications. Upon arrival in Honduras, but prior to going into a community, the pharmacist supervises the sorting, inventorying, unit-dosing and labeling of all commonly used medications. In the community, the pharmacist is part of an interdisciplinary team (including physicians, nurses, nurse practitioners, physician assistants, dentists, obstetricians/gynecologists, translators, and other staff) and is responsible for organizing and managing the pharmacy station.

RESULTS: In 2010, a total of 2382 student volunteers participated in a brigade in 169 communities treating a total of 62,611 underserved, rural Honduran patients. On average, 200–300 patients are seen for general consultation per day, over an 8-hour period. On average, each patient was diagnosed with three disease states and prescribed three medications. Pharmacists were responsible for dispensing an average of 600–900 prescriptions per day. In addition to dispensing, the pharmacist was responsible for dosing medications, conducting therapeutic interchanges, and providing drug information consultations to the medical providers.

CONCLUSION: Pharmacy is a significant component of mobile, "medical brigade" trips that have been made to Honduras. In this setting pharmacists are counted on to work at a fast pace while providing high level clinical services in order to help provide quality, sustainable, medical care.

Cardiovascular

60. The real world management and outcomes of atrial fibrillation. *Carrie W. Nemerovski, PharmD, BCPS, (AQ-CV)¹, Anuvrat Chopra, Pharm.D. Candidate¹, Minu Jacob, Pharm.D. Candidate¹, Sonia Hassan, Pharm.D. Candidate¹, James S. Kalus, PharmD, BCPS, (AQ-Cardiology)¹;* (1) Henry Ford Hospital, Detroit, MI

OBJECTIVES: Atrial fibrillation (AF) is the most common cardiac arrhythmia encountered in clinical practice. Adherence to evidenced based treatment guidelines and the resulting outcomes in routine clinical practice has not been adequately described. This

study aimed to describe the management and outcomes of patients hospitalized with AF in an urban hospital in the United States.

METHODS: This prospective observational study was conducted from July 2011 through February 2012. Included patients had an admitting diagnosis of atrial fibrillation and/or atrial flutter and were followed throughout their inpatient stay and for 90 days following discharge. Study outcomes were to describe the management of AF, to assess adherence to guideline recommendations, and to determine the rate of hospital readmission.

RESULTS: A total of 230 patients were included. Average age was 66.2 years, 43.4% had heart failure, 10.0% had a previous stroke or TIA, and the median CHADS₂ score was 2. Rhythm control was selected in 51.7% of patients. In patients treated with rate control, metoprolol was most commonly used (66.1%). In those treated with rhythm control, amiodarone was the most common medication (34.5%) while procedures alone were used in 33.6% of patients. Antiarrhythmic drug selection and dosing was appropriate for cardiovascular co-morbidities and renal function in over 95% of patients. Selected stroke prophylaxis (anticoagulant or antiplatelet) followed guideline recommendations in 78.9% of patients. The 90-day emergency room visit or hospital readmission (ERHR) rate was 36.0%. The ERHR rate was higher in patients treated with a rate control vs a rhythm control strategy (45.0% vs 26.9%; p=0.004) and in patients with heart failure vs without heart failure (52.0% vs 23.1%; p=0.001).

CONCLUSION: This study describes the treatment and outcomes of AF in a real world urban center in the United States. Future studies should explore reasons for hospital readmission in patients hospitalized for AF.

Critical Care

61. Efficacy and safety of low-dose hydrocortisone in cancer patients with septic shock. *Lama H. Nazer, PharmD, BCPS¹, Mohammad Alshaer, PharmD¹, Taghreed Alnajjar, MD², Feras Hawari, MD²;* (1) Pharmacy Department, King Hussein Cancer Center, Amman, Jordan; (2) King Hussein Cancer Center

OBJECTIVES: To describe the efficacy and safety of low dose hydrocortisone (HC) in cancer patients with septic shock.

METHODS: This was a retrospective cohort study. Using the ICU database, adult cancer patients diagnosed with septic shock between January 2007 and December 2010 were identified. Patients enrolled should have received HC (≤ 300 mg/day) for ≥ 24 hours. Patient demographics, steroid history, and cosyntropin test results were recorded. Efficacy was assessed by determining: proportion of patients with reversal of septic shock (off vasopressors ≥ 24 hour), time to reversal, and mortality. Safety was assessed by determining: incidence of hyperglycemia (>150 mg/dL), hypernatremia (>150 mEq/mL), and superinfection (new positive cultures >48 hours after initiating HC).

RESULTS: We evaluated 130 patients; 72 (58.5%) males, mean age 52.1 ± 14.1 (SD) years, and mean APACHE II 23.7 ± 7.7 (SD). Steroid use upon admission and within the past 4 weeks were reported in 23 (17.7%) and 88 (67.7%) patients, respectively. Cosyntropin test at the onset of septic shock was available for 43 patients, 20 (46.5%) who were nonresponders (≤ 9 μ g/dL increase in cortisol level). Reversal of septic shock was reported in 75 (57.7%) patients, median time for reversal was 1.8 days (range 0.13–10.1). ICU mortality was reported in 66 (51.6%) patients, and 28-day mortality was reported in 70 (53.8%) patients. Of the 43 patients with cosyntropin test, shock reversal was reported in 15 patients who were responders and 12 patients who were non-responders. Hyperglycemia, hypernatremia and superinfection were reported in 101 (77.7%), 22 (16.9%), and 60 (46.2%) patients, respectively. Median time for shock reversal was greater in patients who developed superinfection (3.2 vs 2.0 days, p=0.011).

CONCLUSION: To our knowledge, this is the first large study evaluating steroids in cancer patients with septic shock. Despite resolution of septic shock in more than half of the patients, the incidence of superinfection and mortality rate were high. These findings warrant further investigations.

62. Drug utilization and cost in cancer patients with severe sepsis and septic shock. Lama H. Nazer, PharmD, BCPS¹, *Mohammad Alshaer, PharmD*²; (1) Pharmacy Department, King Hussein Cancer Center, Amman, Jordan; (2) Department of Pharmacy, King Hussein Cancer Center

OBJECTIVES: To describe the drug utilization pattern and the associated cost in cancer patients with severe sepsis and septic shock.

METHODS: A retrospective cohort study of patients admitted to a 12-bed medical/surgical intensive care unit (ICU) of a comprehensive teaching cancer center. Patients with severe sepsis or septic shock who were treated in the ICU between January and December, 2010 were identified through the ICU sepsis database. Severe sepsis and septic shock were defined based on the definitions of the Society of Critical Care Medicine. Patient demographics, length of stay and mortality were recorded. In addition, the type and number of prescribed medications, culture results, and total patient charges for each medication were determined.

RESULTS: During the study period, 116 cases were identified: 65 (56%) patients were males, mean age was 51.7 ± 14.8 (SD) years, and the mortality rate was 48%. Upon presentation, mean APACHE II was 21.8 ± 7.8 (SD), and 30 (25.9%) patients had neutropenia. In addition, 105 (90.5%) patients had septic shock while the remaining had severe sepsis. The mean number of medications prescribed and the mean patient charges were 11.7 ± 4.64 (SD) and $\$3219 \pm 3648$ (SD), respectively. The most common medication classes were acid suppressive therapy, glycopeptides penicillins/cephalosporins and vasopressors prescribed in 113 (97%), 104 (89.7%), 103 (88.9%), and 102 (88%) patients, respectively. The highest medication costs were associated with antifungals (average $\$1653$ /patient) and colony stimulating factors (average $\$1064$ /patient), prescribed in 55 (47.4%) and 37 (31.9%) patients, respectively. Medication costs were higher in non-survivors ($\$4701$ vs $\$1835$, $p < 0.05$), and in patients with positive cultures ($\$4103$ vs $\$2393$, $p < 0.05$).

CONCLUSION: To our knowledge, this is the first study describing the medications used and associated cost in cancer patients with severe sepsis and septic shock. Multiple medications are prescribed which are associated with significant cost. The appropriateness and clinical benefits of the therapies used warrants further investigations.

63E. Validation of a new excel-based insulin infusion protocol using moderate blood glucose control in a mixed adult intensive care unit.

*Christopher Tan, PharmD*¹, Julie Nguyen, PharmD¹, Kathy Cazares, PharmD¹; (1) Inpatient Pharmacy (MCHK-PY), Tripler Army Medical Center, Honolulu, HI

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Education/Training

64. Development of a pharmacy grand rounds program at an academic health system. *Christopher Paciullo, PharmD*¹, Elisabeth Donahey, PharmD², Janice Glascock, PharmD¹, Maha Safwat, PharmD¹, Amir Emamifar, PharmD, MBA¹; (1) Emory Healthcare; (2) Loyla University Health System

OBJECTIVES: In 2010, Emory Healthcare (EHC) implemented a structured Pharmacy Grand Rounds (PGR) to assist pharmacists in achieving Continuing Education goals and enhancing patient care. Live PGR presentations are held at the two largest EHC campuses, and three other EHC sites use distance learning technology to participate. In order to assess the value of this program to the EHC Department of Pharmaceutical Services, an electronic survey was distributed to all EHC pharmacists.

METHODS: Surveys were distributed to all current full time and part time pharmacists at EHC. General demographics including primary site, shift worked and primary position were obtained. Questions assessing the value and impact of PGR utilized a five-point Likert scale for responses, as well as a free text area for comments. Results were compared using non-parametric statistics.

RESULTS: A total of 86 responses were received (42.4% response rate). The majority of pharmacists (66%) worked at Emory University Hospital. 69.7% worked day shift, and 43% were Clinical Pharmacist 1's. 86% had attended PGR, and 44.18% received >6 hours of continuing education from PGR. Seventy-two percent of pharmacists felt that PGR provided them with new information that helped them care for patients, and 69.8% said that the topics were applicable to their practice. Most pharmacists (55.8%) believed that PGR allowed for increased interaction with their colleagues. A majority of presenters (76.9%) will use their PGR presentation again, and believed that presenting at PGR was useful for their professional development (92.3%). The most common free-texted feedback was to have the ability to watch recorded presentations online.

CONCLUSION: PGR at EHC has been a successful endeavor, with high participation and value to both participants and presenters. PGR will continue to provide over 20 hours of continuing education per year.

Endocrinology

65. Assessment of the pain experience and impact of care among patients with painful diabetic peripheral neuropathy (pDPN). *Christie Schumacher, PharmD, BCPS, BC-ADM, CDE*¹, Scott Glossner, PharmD, MPH, BCPS¹, Ha Huang, PharmD Candidate¹; (1) Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL

OBJECTIVES: The Centers for Disease Control and Prevention estimates that 23.6 million people in the United States have diabetes (DM). Diabetic neuropathy is one of the most frequent complications of diabetes. Chronic sensorimotor distal symmetric polyneuropathy, also known as painful diabetic peripheral neuropathy (pDPN), is the most common of all diabetic neuropathies.

METHODS: A self-administered patient survey was used to evaluate patients with type 2 diabetes to determine if they had pDPN and if so, the impact of pDPN on their function and quality of life, as well as their satisfaction with their current treatment following a cross-sectional study design. The project was approved by the Midwestern University Investigational Review Board. Data elements included patient demographics; diabetes history; pDPN history, pDPN impact on activity level sleep, and quality of life; and satisfaction with current treatment. Data were collected throughout the 2012 year. Data were gathered via a scan forms and then were input into a Microsoft Excel database for further evaluation. Descriptive statistics were reported for all parameters.

RESULTS: Seventy-one individuals with DM participated in the project. Only 22% of patients were told they had pDPN yet 54% reported burning, aching or tenderness in their hands, arms, legs or feet. Over 50% of those with nerve pain had experienced the pain for over 1 year. Less than one in five patients (14%) reporting pDPN were receiving treatment.

CONCLUSION: pDPN may be under diagnosed and under treated with our patient population. This is perhaps a missed opportunity for helping DM patients meet their quality of care goals.

66. Implementing a pharmacy consult model for multimodal insulin therapy. *Angela Hodges, PharmD*¹, James Hall, PharmD², Esther Castellanos, PharmD², Margaret Brozek, PharmD²; (1) Department of Pharmacy, Huguley Memorial Medical Center, Fort Worth, TX; (2) Huguley Memorial Medical Center, Fort Worth, TX

OBJECTIVES: Hyperglycemia has been associated with increased thrombosis, increased pain sensation, decreased wound healing and decreased immune response. For these reasons and other the American Diabetes Association recommends that non-critically ill hospitalized patients be treated with multimodal insulin therapy to maintain blood glucose levels from rising above 180 mg/dL. In order to address this recommendation the pharmacy department developed a multimodal insulin therapy service for patients who

have had two blood glucose levels >180 mg/dL within any 12 hour period.

METHODS: A weight-based insulin dosing protocol was developed for calculating and adjusting nutritional and basal insulin needs. All pharmacists were trained on the use of the nomogram and passed competency assessment before the program began. The pharmacists were notified when patients experienced two blood glucose readings >180 mg/dL with 12 hours through hyperglycemia alerts which were already being sent to physicians through the computer system. The pharmacist acquired multimodal insulin therapy consults through follow-up phone calls or direct physician computer orders entry. The protocol requires that previous diabetes related medication be discontinued and replaced with a basal/bolus regimen which includes correctional scale insulin. A daily blood glucose average <180 mg/dL while avoiding hypoglycemia was the therapeutic goal. By day three of the consult, patients should have a daily blood glucose average <180 mg/dL.

RESULTS: The pharmacy multimodal dosing protocol was approved through both the Pharmacy and Therapeutics and Medical Executive Committees. Pharmacy managed 157 patients over a 90 day period. The goal of a blood glucose average <180 mg/dL by day three was attained by the second month of service.

CONCLUSION: A pharmacy consult model for multimodal insulin therapy can be successfully implemented and include the entire staff of pharmacists. The program was well received and patient goals were met.

Family Medicine

67. Interdisciplinary continuous quality improvement within a family medicine residency clinic: response to citalopram-associated QT prolongation. *Jacqueline N. Foster, Pharm.D., BCPS¹, John T. Holmes, Pharm.D., BCPS¹, Brooke Pugmire, Pharm.D., BCPS¹, Eliza Z. Borzadek, RN, Pharm.D., BCPS¹, Rex W. Force, Pharm.D., BCPS, FCCP¹;* (1)Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID

OBJECTIVES: To implement an interdisciplinary, comprehensive program of continuous quality improvement (CQI) in response to important medication-related safety warnings.

METHODS: Using a protocol developed through the collaboration of nurses, psychologists, pharmacists, and primary care providers (PCP), we were able to systematically evaluate individual patient factors that may influence the cardiovascular safety of citalopram use. Under the team's protocol, patients identified in electronic health records were invited by student pharmacists to participate in the CQI program. Patients electing to participate were seen by a clinical pharmacist to obtain an ECG, labs, baseline assessment of current and past medical problems, detailed medication history (e.g. drug-drug interactions, QT prolonging agents, drugs affecting electrolytes), and assessment of depression and/or anxiety using the Patient Health Questionnaire (PHQ-9) and/or Beck Anxiety Inventory. Recommendations to continue, discontinue, reduce dose, or switch to another antidepressant were then made to the PCP and instituted by the clinical pharmacist. Follow-up, including assessment of antidepressant discontinuation syndrome and change in depression/anxiety symptoms, was completed by student pharmacists and clinical pharmacists on a pre-specified timeline. Patients electing not to participate in the CQI program received a comprehensive chart review with recommendations regarding citalopram use and follow-up made to the PCP.

RESULTS: Using an interdisciplinary approach, the CQI team was able to generate consensus for evidence-based care and follow-up of patients on citalopram and provide comprehensive pharmacotherapy that incorporated multiple facets of patient-centered care. To date, 150 patients have been contacted, with 73 completing the CQI program.

CONCLUSION: FDA-mandated monitoring recommendations for the important and potentially common medication-related issues surrounding citalopram served as a nidus for the successful creation of an interdisciplinary, pharmacy-led CQI team designed to systematically and continuously identify and resolve significant

medication and workflow-related problems, and thus improve patient-centered care.

Geriatrics

68. Possession and management of medication lists among seniors residing in the community and the role of the pharmacist. *Carmela Avena-Woods, Pharm D¹, Danielle Ezzo, Pharm D², Arlene Cheng, PharmD, Candidate, 2013³;* (1)United States, St. John's University, Queens, NY; (2)St. John's University, Queens, NY; (3)St Johns University, Jamaica, NY

OBJECTIVES: Seniors are often encouraged to use medication lists, share it with all healthcare professionals and carry it with them at all times. However, it has been noticed that the possession and content of the medication list varies greatly and may be infrequently updated. The objective of this study is to determine the possession of medication lists among seniors residing in the community to better understand the potential future role of pharmacists and to assist pharmacists in providing a focus for patient education.

METHODS: A 15-question survey was distributed to seniors residing in the community from July 2012 to December 2012. Completion of the survey was voluntary and anonymous and no compensation was given. The survey focused on questions regarding details of their medication list, if they had one at all.

RESULTS: Over 150 surveys were distributed. The majority of participants were females (83.9%) and between 80–89 years old (44.6%) with high school reported as the highest level of education (44.9%). Over 37% of seniors reported taking 4–6 medications including prescription and non-prescription; while 32.2% took 1–3 and 11% took 10–12 medications. Over 49% of seniors reported not having a medication list with them "right now" and 82.4% reported having one at home. Only 1.9% reported that a pharmacist updated their medication list. Approximately 55% of participants reported speaking to their pharmacists about their prescriptions.

CONCLUSION: Identifying the possession and proper management of medication lists will help pharmacists further recognize their role and the need for additional pharmacy services for seniors. The results of this study will be used to assist in developing senior education programs focusing on the importance of carrying an updated medication list. The ultimate goal is to enhance and establish patient-pharmacist relationships while maximizing patient's safety.

69. Falls in elderly: a key role for pharmacist in educational programs? *Vanida Brunie, PharmD¹, Sawsan Al Rifai, MD², Anne Signor, Nurse²;* (1)Pharmacy, Emile Roux Hospital, Assistance Publique-Hopitaux de Paris, Limeil-Brevannes, France; (2)Emile Roux Hospital, Assistance Publique-Hopitaux de Paris, Limeil-Brevannes, France

OBJECTIVES: The proportion of community-dwelling elderly in the society increases and fall frequency increases with advancing age. Many falls result in fractures and also soft tissue injuries, functional impairment, reduced quality of life, increased mortality, and excess in healthcare costs. Due to the magnitude of these negative effects, a variety of single- and multicomponent fall-preventive intervention programs have been initiated. Even if falls are not considered as a chronic disease, therapeutic education may also be a solution to this problem. The aim of this program is to enable elderly patients to manage fall-risks and consequences and improve their quality of life.

METHODS: A new multidisciplinary program was set, including a pharmacist, physicians and nurses. Hospitalized patients who experienced one fall over the last year entered the program.

RESULTS: The program was set in a gerontology hospital and divided into three steps: patient pre-evaluation, group sessions and a patient post-evaluation where patients were encouraged to fully express their opinion on the program. Group sessions were organized on five workshops: "fall risk factors," "fall risk factors at home," "how to get up after a fall," "falls and muscles,"

“drugs, food and falls.” Patients could attend 1–3 sessions of each workshop. The workshop dealing with treatments was moderated by the pharmacist.

CONCLUSION: Interdisciplinary programs promoting therapeutic education do not often involve the pharmacist. However, he can play a key role in therapeutic education programs and be involved in the choice of the educational method and patient training. As drugs are often involved in falls in elderly patients, pharmacist’s engagement in this topic should be promoted.

Health Services Research

70E. Impact of a pharmacist discharge counseling and transitions in care program on heart failure readmission rates. *Jennifer Lukaszewicz, PharmD¹, Tanya Dougherty, PharmD, BCPS², Nishaminy Kasbekar, BS, PharmD, FASHP², William Matthai, Jr, MD, FACC²;* (1)Hospital of the University of Pennsylvania, Philadelphia, PA; (2)PENN Presbyterian Medical Center, Philadelphia, PA

Presented at University HealthSystem Consortium Meeting, Las Vegas, Nevada. December 1, 2012.

Hematology/Anticoagulation

71. Effect of pharmacist intervention on dabigatran utilization. *Sarah Barlow, PharmD, RPh¹, Arthur Roby, PhD, MSc, BSc¹;* (1) Community Medical Center, Toms River, NJ

OBJECTIVES: To assess utilization of the oral anticoagulant Dabigatran.

METHODS: Each order for Dabigatran was reviewed by the pharmacist for appropriateness in regard to dosing relative to renal function and concomitant anticoagulant therapy based on information provided in the package insert. The pharmacist contacted the physician if there were any recommendations to discontinue concomitant anticoagulant therapy or change the initially prescribed dose due to creatinine clearance. Data was collected from September 1, 2011 to June 10, 2012.

RESULTS: There were 242 orders for Dabigatran evaluated during the 10-month study period. From a renal dosing perspective 190 orders (78.5%) were appropriate, 21 orders (8.6%) were for renal dose Dabigatran when full dosing was indicated, 18 orders (7.4%) were for full dose Dabigatran when renal dosing was indicated, one patient (0.4%) was ordered Dabigatran with CrCl <15 mL/minute, and 12 orders (4.9%) were classified as other. Pharmacists intervened on 41 dosing issues, 21 recommendations (51.2%) to change dose based on renal function were accepted by the prescriber. There were 209 (86%) patients who were converted from other anticoagulants to Dabigatran appropriately. Orders for Dabigatran and subcutaneous heparin occurred in 21 cases (8.6%), orders for Dabigatran and Enoxaparin occurred in nine cases (3.7%), orders for Dabigatran and intravenous heparin occurred in two cases (0.8%), one patient (0.4%) was prescribed both Dabigatran and warfarin. Pharmacists intervened on 22 duplicate therapy cases, 18 recommendations (81.8%) were accepted by the prescriber. There was a decreasing trend in number of the prescribing errors, 38 errors in the first half and 25 in the second half.

CONCLUSION: Pharmacotherapy recommendations about dosing and duplication of therapy were accepted by the prescriber in 51.2% and 81.8% of cases, respectively. Education was provided during each call and prescribing errors seemed to decrease.

Infectious Diseases

72E. Compliance with surgical antibiotic prophylaxis at a regional hospital in northern Taiwan. *Chieh-Yu Lin, BS¹, Ju-Huei Tseng, MS¹, Chu-Chun Chen, Bachelor¹, Sue Lin, OW, Pharmacist Student², Pin Huai, LIU, Pharmacist Student², J. E. Chun Lin, Pharmacist Student², Cih-Yi Shin, Pharmacist Student², Yu-Mei Lin, Master¹;* (1)Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei, Taiwan; (2)College of Pharmacy, Taipei Medical University, Taipei, Taiwan

Presented at Department of Pharmacy, Taipei Medical University-Shuang Ho Hospital.

Medication Safety

73E. Medication errors in pediatric oncology patients. *Mohannad AlSallal, PharmD¹, Abdullah Amireh, PharmD², Suha Al Omar, PharmD²;* (1)Pharmacy, King Hussein Cancer Center (KHCC), Amman, Jordan; (2)King Hussein Cancer Center, Amman, Jordan

Presented at The Jordanian Society of Pediatric Oncology (JSPO), Amman, Jordan, Nov 7–10, 2012.

74. Impact of pharmacist driven hydromorphone dose restriction protocol on patient safety in a large community hospital. *Jessica Hill, PharmD, BCPS¹, Sarah Barlow, PharmD, RPh², Arthur Roby, PhD, MSc, BSc²;* (1)Department of Pharmacy, Community Medical Center, Toms River, NJ; (2)Community Medical Center, Toms River, NJ

OBJECTIVES: To improve utilization of HYDROmorphone and decrease the number of adverse drug reactions (ADRs) associated with the use of HYDROmorphone.

METHODS: The Medical Executive and Pharmacy and Therapeutics committees approved a protocol for pharmacists to contact the prescriber of orders for HYDROmorphone doses >1 mg. The pharmacist would discuss the patient case, drug potency, morphine equivalencies, possible complications or risks and alternative medications to avoid excessive dosing of HYDROmorphone. The hospital-wide initiative was implemented on August 1, 2011. HYDROmorphone dose data was collected using the facility’s charging software, Affinity, for all patients with a charge for intravenous HYDROmorphone between June 2010 and September 2012. ADR data was collected from facility reporting databases. Data was analyzed using Microsoft Excel and Access. Statistical significance was evaluated with the unpaired *t*-test.

RESULTS: Over the 14-month period prior to implementation there were a total of 25 HYDROmorphone related ADRs reported; after implementation there were 6 HYDROmorphone related ADRs reported ($p=0.0009$). In the pre-intervention and post intervention group, the mean number of doses >1 mg was 108.14 orders per month and 30.92 orders per month respectively ($p=0.0001$).

CONCLUSION: The pharmacists’ dose restriction interventions led to a statistically significant decrease in ADRs related to the use of HYDROmorphone and a statistically significant decrease in the number of HYDROmorphone orders >1 mg.

75. Expanding the line of clinical pharmacy services (CPS) to monitor compliance with smart pump technology (SPT) improves the safety of IV drug administration. *Anna Dushenkov, MSc Ed, RPh, Pharm D, BCPS¹, Jack Mateyunas, RPh¹;* (1)Huntington Hospital NS LIJ HS

OBJECTIVES: Over 60% of the most serious ADEs are related to IV drug administration. The SPT utilizes a preprogrammed Drug Library, and tracks its observance in real time, thus offering the opportunity for close monitoring and timely feedback, which could result in safer IV administration. Since medication safety has always been at the core of CPS, expanding the CPS to monitor the utilization of the SPT appears to be the logical step in the institutional’s efforts to improve the safety of IV drug administration.

METHODS: Prospective observational case study.

RESULTS: The baseline institution’s compliance with SPT was 77%; in the following year it has increased to 91%, with “heavy use” units e.g. Critical Care averaging 96%. At the same time it was observed that the incidence of preventable ADEs (pADEs) related to IV drug administration was decreasing. Notably, pADEs associated with the administration of IV heparin, previously being the most prevalent, have substantially declined. The observed increase in SPT compliance was due to the interdisciplinary initiatives prompted by the CPS: (1) automatic electronic

distribution of real time infusion status unit-based reports along with daily rounds by Nurse Managers supplemented by as-needed rounds by clinical pharmacists and nursing administration; (2) continuous educational efforts in creating a culture of appreciation of the SPT as a positive feature aimed to increase patient's and operator's safety vs a nuisance extra programming step, which slows down the administration process; (3) regular Drug Library updates leading to nursing satisfaction and acceptance of the Library; (4) feedback presentations at Nursing meetings.

CONCLUSION: The CPS was essential in substantially increasing compliance with the SPT that was accompanied by the safer IV drug administration. Monitoring and analysis of the SPT performance should be included in the routine compendium of clinical pharmacy activities.

76. Does a CPOE reduces medication errors? A method to evaluate it. Elyes Majoul, Resident¹, Fabien Hernandez, Resident¹, Carlota Montes-Palacios, Student¹, Marion Buyse, PharmD, PhD¹, Christine Fernandez, PharmD, PhD¹, Marie Antignac, PharmD, PhD¹, Patrick Hindlet, PharmD, PhD¹; (1)Pharmacy, Saint Antoine Hospital, Assistance Publique-Hôpitaux de Paris, Paris, France

OBJECTIVES: Medication errors have been identified as one of the most important causes of adverse drug events. Computerized physician order-entry (CPOE) systems are currently considered to be appropriate solutions for reducing medication errors. However, most of time, the impact on health care quality of a CPOE are not measured and objectively assessed. An analytical pre-post study is proposed to study the impact of the implementation of a CPOE and to assess its benefits and risks.

METHODS: A two step evaluation (pre and post CPOE implementation) was settled up.

RESULTS: Prescription, preparation and administration are evaluated in an orthopaedic surgery department. The frequency and nature of errors are measured by pharmacists during a 1-day observational survey. Preimplementation study: drugs prepared (name, dose, solvent and volume for IV route) are first recorded over a 24-period. Administration is then evaluated (drug, dose, time) and, at the end of the period, prescriptions are copied. To avoid detection bias, the pharmacist is blind to drug prescriptions until the last step. The two first data sets (prepared and administered drugs) are compared to prescribed drugs. Discrepancies and errors (drug omission, wrong dose, ...) are noted. Prescription quality is also assessed (completeness in prescribing fields, drug interactions, ...). In order to minimize the influence of the week day and to increase the number of observations, the survey is repeated. The clinical unit is not previously informed of the date of the study. Postimplementation study: same observational survey after implementation of the CPOE. The frequency and nature of errors are compared without and with CPOE.

CONCLUSION: The frequency and the severity of medication errors are expected to decrease with CPOE implementation. However, some reported experiences show the opposite. Hence, pre-post implementation studies should systematically be conducted to validate the benefit/risk balance of these systems.

Nephrology

77. Pharmacist-directed endeavor to streamline management of anemia in chronic kidney disease. Agnieszka Pasternak, PharmD, MBA, RPh, CNSC¹, Denise Yost, RN¹, Monica Kaul, MD¹; (1)NS LJ Health System, Huntington Hospital, Huntington, NY

OBJECTIVES: This study evaluated a pharmacist-directed initiative to streamline anemia management and quantify potential cost-savings in a community hospital-based hemodialysis center.

METHODS: Records of 12 stable hemodialysis-dependent CKD out-patients from June to October 2011 (Control group, n=6) and November 2011–May 2012 (Intervention group, n=6) were reviewed and compared using the Mann–Whitney *U*-test for continuous variables. The approach was to reserve iron loading to patients with TSAT \leq 20%, ferritin \leq 500 ng/mL and ESA initi-

ation to epoetin-naïve patients with hemoglobin(Hgb) $<$ 10 g/dL. Patients previously on ESA, in whom dose was interrupted for Hgb \geq 11 g/dL, were re-initiated at 25% reduced dose when Hgb $<$ 10.5 g/dL. Iron studies were repeated 7 days after loading and Hgb testing weekly (off-ESA) or every other week (on-ESA). Adjustments in ESA were according to the Product Information.

RESULTS: There was a significant difference in the median Ferlecit[®] dose in the Control vs Intervention groups (8 vs 18.5, $p < 0.030$) and cost (\$142.44 vs \$273.01, $p < 0.045$). Significantly higher median rate of overutilization of Hgb testing was prominent in the Control group (81.75% vs 26.39% respectively, $p < 0.043$). While not meeting statistical significance, guideline-directed ESA therapy led by a pharmacist showed better median Hgb readings (10.3 vs 11.0 g/dL, $p < 0.422$) with a 77.5% improvement in the median rate for ESA dosing adjustment (22.5% vs 100%, $p < 0.452$) by consuming less median epoetin dose and decreasing median total epoetin cost (\$1984 vs \$812, $p < 0.572$) when comparing the Control and Intervention groups.

CONCLUSION: The strategy of pharmacist-directed anemia management was associated with improved ordering of laboratory tests and higher implementation rate for necessary epoetin dosing adjustments with lower ESA doses. The study's sample size was too small to show that increasing iron reduces epoetin requirements and further studies are desirable to assess precise timing and frequency of laboratory testing to streamline management of anemia with ESA and iron therapies. However, pharmacist-directed management resulted in a five month drug and laboratory cost savings per patient of \$179.28.

Neurology

78. Impact of introducing pharmacy services to pediatric neuro-oncology setting. Sherif Kamal, Director of Department of Pharmaceutical, Service¹, Sherif Abouelnaga, PhD¹, Maggie M. Abbassi, PhD², Azza M. Agha, PhD²; (1)Children Cancer Hospital Egypt, Cairo, Egypt; (2)Faculty of Pharmacy, Cairo, Egypt

OBJECTIVES: To assess the impact of introducing clinical pharmacy services to neuro-oncology clinic

METHODS: A prospective review of pediatric brain tumor patients was performed to evaluate the effect of VPA on postoperative seizure prophylaxis. The patients were monitored for a period of 3 months postoperatively to determine whether VPA was effective in prophylaxis from seizures. The data collected included the patient's age, sex, weight, prescribed antiepileptic drugs (AED), platelet count, albumin, liver enzymes, duration of VPA treatment, serum VPA concentration and any other medications the patients were receiving. Any clinical intervention and any drug interaction were recorded.

RESULTS: Impact of clinical Pharmacy Service in neuro-oncology

- 1 Reduction in the duration of Valproic prophylaxis from 6 month to only 3 month and we are aiming to reduce the duration to 1 month postoperatively.
- 2 Cost saving of 18916 LE on consumption of VPA (2011/2012 cost)
- 3 Increased patient satisfaction, because of the follow up visits and face to face communication done by the study.
- 4 Improved Pharmacokinetic lab service and follow up on the recommendations.
- 5 The Seizure severity scale and Side effects scale is now used routine for all brain tumor patients, and other forms are being prepared for other diseases.
- 6 The patients were visiting the pharmacy every hospital admission asking for consultation.

CONCLUSION: As the services started following up patient since 5/2011, financial, clinical and humanistic benefits were very clear to be achieved.

Oncology

79. Fotemustine in the treatment of high grade gliomas. David Gómez, Sr, Pharmacist¹, Ana Colón, Pharmacist², Eva Martínez, Pharmacist², Ana García, Pharmacist^{1,2}, Virginia Martínez, Pharmacist^{1,2}, Marta Valero, Pharmacist^{1,2}; (1) Hospital Pharmacy Department, Marqués de Valdecilla's University Hospital, Santander, Spain; (2) Marqués de Valdecilla's University Hospital, Santander, Spain

OBJECTIVES: Describe our experience with Fotemustine, third-generation nitrosourea, in patients with high-grade gliomas (off-label use), after progression to primary treatments.

METHODS: Retrospective-observational study in patients with high-grade gliomas treated with Fotemustine during the last 6 years. Previous treatments, posology and number of cycles received were reviewed using clinical history and the electronic medical records.

RESULTS: Eight patients (5/men) with a mean age of 50.8 years (29–62) were treated after progression of high-grade glioma (glioblastoma (6)/astrocytoma (2)). 7/8 patients completed first line treatment: radiation and concurrent Temozolomide (TMZ) during 6 weeks followed by TMZ (STUPP regimen). The other patient did not complete the regimen because of progression. Before the STUPP regimen 6/8 patients underwent surgical resection. One of the other two patients, after progression to first line treatment, received high-doses of TMZ (75 mg/m² during 21 days, every 4 weeks), followed by Bevacizumab (10 mg/kg) plus Irinotecan (125 mg/m²) every 14 days (BEVA + IRINO); and afterwards two cycles of Fotemustine (100 mg/m² every 21 days) (FTM). The other patient received a combination of Bevacizumab/TMZ; followed by Bevacizumab (10 mg/kg) and Fotemustine (100 mg/m²) every 21 days (BEVA + FTM). Among the six patients who underwent resection: two received high-doses of TMZ followed by BEVA + IRINO and BEVA + FTM (2/4 cycles respectively); two others received BEVA + IRINO and BEVA + FTM (2/3 cycles respectively), one patient only received one cycle of FTM; and finally, the last patient received, after Bevacizumab (10 mg/kg every 14 days), five cycles of FTM. This patient continues in treatment with FTM while all the rest died after receiving Fotemustine as described above.

CONCLUSION: In all these cases, Fotemustine has always been used as a third/fourth line treatment after progression of high-grade gliomas. So far, five is the maximum number of cycles of Fotemustine received. However, after the results of the last studies with Fotemustine, frequency and terms of use could be modified.

Pediatrics

80. Development of pharmacy services in a general pediatric outpatient clinic. Lea Eiland, Pharm.D.¹; (1) Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Huntsville, AL

OBJECTIVES: The collaboration of pharmacists and physicians in a general pediatric outpatient clinic is not well documented in the literature compared to pharmacists practicing in pediatric specialty clinics. The aim of this study is to describe the implementation of new pharmacy services in a general pediatric outpatient clinic.

METHODS: An established pediatric clinical pharmacist transitioned from an inpatient to outpatient service consisting of four pediatricians in an academic, medical clinic. To prepare for initiating services, the pharmacist obtained the most common 50 diagnosis codes and medications prescribed in the clinic for the past 2 years. The top results of each were used to develop patient educational materials. Services were provided for 3 half-days and 1 full day weekly. The pharmacist completed chart reviews, medication assessment histories, patient/caregiver education, and counseling for 2 months and then introduced two pharmacy students every 5 weeks on the service for 4 months. Clinical interventions were documented in a commercially-available, online documentation system.

RESULTS: In the first 6 month period, 1052 interventions were documented by the pharmacist and six students. There were 562 chart reviews conducted, 262 patient medication histories obtained, and 77 patients/caregivers counseled. An average of 47 patients were seen weekly by students in collaboration with the pediatricians. The pharmacist with students could work along two to three pediatricians each day vs one pediatrician without students. Patient educational handouts (n=10) regarding eight disease states and two monitoring guidelines were developed. Handouts were provided to patients on average 2–3 times per week.

CONCLUSION: The implementation of a pharmacist in a pediatric outpatient clinic has resulted in numerous patient interventions. Collating background statistics of the patient population assisted with development of patient educational materials. Student pharmacists were able to integrate into providing patient services as well as expand services beyond the pharmacist.

81. Pharmacovigilance project in pediatrics: the experience of ASL BA. Marcella Laterza¹, Grazia Mingolla¹, Angela Chielli¹; (1) Area Gestione Farmaceutica ASL BA, Italy

OBJECTIVES: Clinical trials conducted on children are limited because of ethical, scientific and economic constraints. As a result, safety and efficacy data with regards to pediatric population are often extrapolated from those obtained from clinical trials conducted on adults. Pharmacovigilance is therefore very important for this patients group.

MATERIALS AND METHODS: ASL of Bari has been appointed by region of Puglia as coordinating center for inter-regional project "Monitoraggio degli Eventi Avversi in Pediatria (MEAP)". In first stage of project, meetings were organized with pediatricians to promote voluntary reporting and provide logistical support to physicians. In second stage, reports were collected and sent to Department of Clinical Pharmacology at Sacco Hospital in Milan. A newsletter called "pharmacovigilance reminder" was also created and sent to pediatricians to report potential drug interactions, possible adverse reactions, discussions around particularly interesting cases that had been reported and summaries of data collected as well as results of analysis conducted by MEAP center.

RESULTS: During first 4 months, 52 reports on voluntary adverse drug reactions (ADRs) were collected, 17.3% of which regarding drugs. 9.6% of causes of ADRs are not known; of these 40% are severe. Most commonly reported ADRs are those related to diseases affecting the skin and the subcutaneous tissue (32.8%), as well as systemic diseases (29.8%). As it pertains to drugs, most frequently reported active ingredients were morniflumate and association of clavulanic acid and amoxicillin. Vaccine against human papillomavirus is responsible for only 9.3% of total adverse reactions attributable to administration of vaccines, but 100% of those are severe.

CONCLUSIONS: Pharmacovigilance activities carried out at regional level resulted in a significant increase in reports of suspected adverse drug reactions in children. Increased reporting frequency and higher level of detail obtained from reports, show how information and collaboration between physicians and Pharmacovigilance Units improves risk-benefit profile of drugs.

Pharmacoeconomics/Outcomes

82. Development of a proactive medication review program to address preventable medication related readmissions. Lisa Schatz, BS, Pharm.D.¹, Amy Blommel, Pharm.D.²; (1) Department of Pharmacy, Wheeling Hospital, Wheeling, WV; (2) Wheeling Hospital, Wheeling, WV

OBJECTIVES: As Medicare heightens regulations regarding payments for hospital readmissions within 30 days, it is increasingly important to screen high risk patients for medication related problems to decrease preventable readmissions.

METHODS: A literature search was conducted to identify drug classes and disease states that lead to frequent hospital admissions. Based on the literature, we are targeting high risk medications: patients on warfarin with nontherapeutic INR's, patients

with hypo/hyperglycemia, patients presenting with seizures that had subtherapeutic drug levels, and patients on high risk or narrow therapeutic index medications such as digoxin, dabigatran, apixaban and rivaroxaban. In addition, it was felt that patients on seven or more medications would also be at risk for preventable drug related readmissions. Focused checklists were developed for each of the category of patients described above to identify medication related issues that could potentially result in an early hospital readmission. These focused checklists will standardize the pharmacist's approach when reviewing patients for medication related issues. For example, a focused drug regimen review checklist was developed to aide the pharmacists in identifying and resolving problems associated with polypharmacy such as medication reconciliation, drug/drug interactions, therapeutic duplications, drug related problems, and to aid in patient counseling.

RESULTS: This new program was launched in January 2013, thus results are too soon to report. A prospective review of readmissions that have drug related issues contributing to their problems will be reviewed on an ongoing basis and our program revised.

CONCLUSION: With implementation of these checklists, a pharmacist led program to consistently recognize and identify drug related issues in a standardized format has high potential to prevent unnecessary medication related hospital readmissions. In addition to avoiding Medicare payment penalties due to early hospital readmission, our program will result in increased patient safety and improved patient satisfaction.

RESIDENT AND STUDENT RESEARCH-IN-PROGRESS

Ambulatory Care

83. Assessing diabetes knowledge and impact on achieving hemoglobin A1c goals in a veterans affairs population. *Svetlana Goldman, PharmD¹, Angela Porter, PharmD², Barbara Gerding-Owen, RN²*; (1)Department of Pharmacy, Charles George Veterans Affairs Medical Center, Asheville, NC; (2)Charles George Veterans Affairs Medical Center, Asheville, NC

OBJECTIVES: The primary objective of this study is to examine if patients' diabetes-related knowledge is associated with hemoglobin A_{1c} (HbA_{1c}) values. The secondary objective is to examine if patients' diabetes-related knowledge varies across different outpatient clinics (diabetes specific, pharmacist managed, and physician managed).

METHODS: This study retrospectively examines patients' last four HbA_{1c} values and then measures diabetes related knowledge using a modified version of the Diabetes Knowledge Questionnaire (DKQ). The DKQ assesses patients' understanding of normal blood glucose levels, HbA_{1c} goals, diabetes complications, diet, exercise, and proper medication usage. The highest score possible on the modified DKQ is 25 points. Additional data collected includes information regarding diabetes medications, previous diabetes education, demographic information, and health literacy assessment. Inclusion criteria are patients at the Asheville Veterans Affairs Medical Center who are diagnosed with diabetes and taking insulin therapy in physician managed, pharmacist managed, and specific diabetes clinics. Exclusion criteria are patients with a diagnosis of psychotic disorder, dementia, or blindness (conditions that may interfere with accurate measurement of knowledge).

RESULTS: A total of 200 completed questionnaires have been collected. Demographics of those reported include mostly male veterans (96.75%) with type 2 diabetes (90.06%) between the ages of 60–69 (51.6%). The average HbA_{1c} among all the patients surveyed was 8.03% (diabetes clinic 8.46%, pharmacist managed risk reduction 7.95%, physician managed primary care 7.67%, and pharmacist managed primary care 8.02%). The average score for the diabetes knowledge survey among all veterans was 18.89 with the highest average score found in the diabetes clinic (19.62) and the lowest average score in the physician managed clinic (18.28).

CONCLUSION: Final analysis will determine whether a correlation exists between diabetes knowledge and HbA_{1c} values. This

data will provide clinicians with more information on how to best tailor patient education to help patients achieve HbA_{1c} goals.

84. Impact of student run medication reconciliation service on the identification of drug related problems. *Michael Schontz, PharmD Candidate¹, Joshua Snodgrass, PharmD Candidate², Autumn L. Stewart, PharmD²*; (1)School of Pharmacy, Duquesne University, Pittsburgh, PA; (2)Duquesne University, Pittsburgh, PA

OBJECTIVES: Medication reconciliation is an integral service that must be performed to ensure patient safety during transitions through hospitals, clinics, and primary care offices. Often thought to strictly coordinate a list of medications, the service goes beyond this and may be used to impact patient care. Previous studies have shown that medication reconciliation provides an opportunity for pharmacists to identify drug related problems. This study seeks to (1) describe a model of care in which student pharmacists are engaged in medication reconciliation services, and (2) document the impact of this model on the identification of drug therapy related problems.

METHODS: This is an observational, retrospective study of clinical interventions documented by PY4 APPE students throughout the course of a 5-week required ambulatory care rotation. The rotation site is a health care center providing free care to uninsured low income adults. Medication reconciliation is an established pharmacy service at the site, primarily conducted by student pharmacists. Students are required to document their interventions as part of the learning objectives/educational methods used in the rotation. Data were collected from an electronic spreadsheet of student interventions from May 2011 through May 2012. Students identified the type of intervention using the following categories: Compliance, Appropriate Indication, Untreated Indication, Safety, Efficacy, Monitoring, Referral, Education, Drug Information, or Other. Documentation also included the type of recommendation and the outcome (accepted, rejected, or other). Data analysis was conducted using descriptive statistics.

RESULTS: Students performed and documented 674 interventions throughout the study period. The need for additional drug therapy was identified in 320 (47.5%) of cases. The most common type of recommendation made by a student was to "initiate a drug" (337, 50%). The majority of recommendations were accepted (89%).

CONCLUSION: A medication reconciliation service model employing the use of student pharmacists is an effective method for identifying drug related problems.

85. Types of medications utilized by patients in a network of family medicine clinics. *Sara Wormley, Pharm.D.¹, Jonathan Meiman, MD², Connie Kraus, Pharm.D., BCACP¹*; (1)School of Pharmacy, University of Wisconsin-Madison, Madison, WI; (2)Wingra Family Medical Center, Madison, WI

OBJECTIVES: (1) To characterize what medications are used in the department of family medicine (DFM) clinics, we intend to use the database to gain more insight into what active medications are listed in patients' charts. (2) To establish characteristic themes that define patients with higher medication use, such as amount of refills, diseases, gender, age, race/ethnicity, and number of provider visits per year.

METHODS: We conducted a retrospective query of an electronic medical record clinical data warehouse, evaluating 2,365 patients seen in primary care clinic at least once from May to November 2011. The medication data and refill history was correlated with patient age, sex, race, ethnicity, marital status, and ICD9 diagnosis. Different patient demographics and co-morbidities were analyzed for association with medication use using univariate and multivariate analyses.

RESULTS: At ages 18–24 years, 15–23% of patients are taking more than five medications, a trend which continues to increase as people age. Polypharmacy is associated with other patient characteristics, including common chronic conditions such as heart disease (minor OR = 1.99, major OR = 3.65), chronic pain

(minor OR = 2.56, major OR = 6.40), diabetes (minor OR = 2.4, major OR = 4.61), dyslipidemia (minor OR = 1.82, major OR = 2.12), and hypertension (minor OR = 2.27, major OR = 2.87). Using the descriptive data from the search, we intend to refine this query process to prospectively identify the patients at high risk for drug-related problems for pharmacist evaluation and recommendations. This will be completed prior to the ACCP virtual poster symposium.

CONCLUSION: This study may benefit society as it will provide characteristics of patients who are at higher risk for polypharmacy and associated drug-related problems based on age, sex, race, ethnicity, marital status, and ICD-9 diagnosis. With this knowledge, primary care providers may become more aware of these patients and spend more time focusing on appropriateness of medication use in the primary care setting.

86. Implementation of pharmacist-led disease state management clinics utilizing the clinical video tele-health system (CVT) to expand health care access to Veterans at an outreach clinic. *Thien Huong Nguyen, Pharm D/MBA¹*; (1) Pharmacy, VA Sierra Nevada Health Care System, Reno, NV

OBJECTIVES: To evaluate the effectiveness of performance improvement initiative utilizing pharmacist-led disease state management clinics via CVT. These clinics will manage chronic disease states such as diabetes, hypertension, and dyslipidemia under the VA Sierra Nevada pharmacy scope of practice.

METHODS: The VA's clinical performance dashboard will be utilized to identify patients within the VA Sierra Nevada Health Care System who have not met therapeutic goals for diabetes, hypertension, and dyslipidemia. Patients will be excluded from the study if they are unable to speak English, unwilling to participate in a CVT clinic. All participants that qualify will be scheduled for a 30 minute CVT clinic appointment at the Winnemucca, NV or Susanville, CA VA outreach clinic. A coordinating CVT appointment will be made for the pharmacy resident at the Fallon VA clinic. The rural health resident will collaborate with registered nurses in Winnemucca and Susanville who will perform and document vital signs and assist with operating the CVT equipment. The resident will interview patients from Fallon, make an assessment based on subjective and objective data, make changes and recommendations in pharmacotherapy as appropriate in order to help these patients reach therapeutic goals. The primary outcome will be the percentage of patients that achieve chronic disease state management goals assessed through HgA1c, LDL, and blood pressure measures. Secondary outcomes will include percentage change from baseline and time to reach goal.

RESULTS: Currently the study has enrolled 30 patients of which 24 patients have completed their first appointment with the pharmacy resident. After nearly 2 months follow-up, the percentage of patients achieves their therapeutic goal has increased from 22% to 50% in blood pressure, from 71% to 88% in LDL level, and from 50% to 54% in Hg A1C level.

CONCLUSION: Study is in progress currently. Full result and conclusion will be reported in Ma.

87. Evaluating follow-through of pharmacists' recommendations in a family medicine residency program. *Ashley Crowl, PharmD¹*, Jean Moon, PharmD, BCACP², Jody Lounsbury, PharmD, BCPS³; (1) Ambulatory Care Residency Program, College of Pharmacy, University of Minnesota, Minneapolis, MN; (2) Department of Pharmaceutical Care and Health Systems, College of Pharmacy, University of Minnesota, Minneapolis, MN; (3) University of Minnesota North Memorial Family Medicine Residency Program, Minneapolis, MN

OBJECTIVES: This study sought to determine the type of follow-through completed after pharmacists offer recommendations to providers (physicians, residents, nurse practitioner, or care coordinators) or patients. The study also examined whether certain types of recommendations are associated with more consistent follow-through than others.

METHODS: This was a retrospective chart review of all pharmacist interventions in-person or via phone documented during August 2012 in a family medicine residency clinic in Minneapolis, Minnesota. Recommendations were tracked on whether follow-up was given to the provider or patient, if follow-up recommendations were met, whether it was a medication therapy management (MTM) or anticoagulation visit, and if the patient was seeing his/her primary care provider that same day.

RESULTS: Preliminary results show a total of 85 patient visits documented during the month of August 2012, of which 55 (64.7%) were recommended to receive a follow-up phone call or return to clinic. Of the 55 patient visits, a total of 45 (81.8%) received follow-up recommendations. The majority (86.7%) of these patients returned to clinic vs received a phone call. Over half (56.3%) of these recommendations for follow-up were given to patients vs providers. Twenty-four visits were classified as anticoagulation visits, of which 95.8% met follow-up recommendations. Forty-two patients saw their primary care provider the same day.

CONCLUSION: This chart review revealed that 35.3% of pharmacist recommendations offered to providers or patients did not receive any form of follow-through, which may lead to sub-optimal patient care; thus, justifying a need to implement a systematic process and tool for documenting to ensure all patients receive follow-through at each visit.

88. Clinical pharmacy service team assists psychiatrists in meeting target goals for meaningful use. *Matthew Atkinson, BA¹*, Stacy Ramirez, PharmD², Bethany Withycombe, BS²; (1) College of Pharmacy, Oregon State University; (2) Oregon State University

OBJECTIVES: To describe how clinical pharmacy services can assist psychiatrists in improving upon unmet target goals for meaningful use in a patient-centered primary care home.

METHODS: Patients of two psychiatrists were contacted and scheduled for a 30-minute appointment with a clinical pharmacy service team member. Each participant came in for a collection of vital signs, as well as a records update of medication allergies and smoking status. Two consecutive 90 day reporting periods were compared to assess the impact of clinical pharmacy services on meaningful use values (percentage of patients with updated vitals, medication allergy list, and smoking status). Benton County Health Department clinical pharmacy service team members included pharmacists, pharmacy residents, and student pharmacists.

RESULTS: Prior to the initiation of this project, the percentage of patients with updated vital signs, medication allergy list, and smoking status for psychiatrist A were 49.4%, 27.6%, and 26.3%, respectively; in this same period the percentages for psychiatrist B were 42.9%, 29.8%, and 25.0%. In the most recent reporting period, the percentage of patients with updated vital signs, medication allergy list, and smoking status for psychiatrist A were 59.5%, 42.0%, and 40.5%, respectively; and the percentages for psychiatrist B were 45.4%, 39.2%, and 32.0%. Overall, this represents a 10.1%, 14.4%, and 14.2% increase in data collection of vitals, medication allergy list, and smoking status for psychiatrist A, and a 2.5%, 9.4%, and 7.0% increase for psychiatrist B.

CONCLUSION: Clinical pharmacy service staff at a patient-centered primary care home can assist psychiatrists with meeting target goals for meaningful use. Data collection concluded on December 31, 2012. Final data will be available for analysis on February 28, 2013.

89. Utilization of angiotensin converting enzyme inhibitors, angiotensin receptor blockers, and beta-blockers in veterans with heart failure. *Courtney Kominek, Pharm.D.¹*, Rachel Chandra, Pharm.D.¹, Brian Burke, MD¹; (1) Dayton Veterans Affairs Medical Center, Dayton, OH

OBJECTIVES: This analysis was conducted to determine the utilization of recommended therapeutics including angiotensin converting enzyme inhibitors (ACE-I), angiotensin receptor blockers (ARB), and beta-blockers (BB) among outpatients with heart fail-

ure at the Dayton, OH Veterans Affairs Medical Center (VAMC). In addition, utilization of medications typically not recommended in patients with heart failure were examined including nonsteroidal anti-inflammatory drugs (NSAID), anti-arrhythmics (AA), and nondihydropyridine calcium channel blockers (NDHP CCB).

METHODS: Data was collected from the Veterans Affairs electronic medical record via the Decision Support System for all outpatients with a diagnosis of heart failure in the fiscal year 2012 at the Dayton VAMC. This query included age, gender, comorbidities, admissions for heart failure, and medications including dosages prescribed. The number and percent of patients taking ACE-Is, ARBs, BBs, NSAIDs, AAs, and NDHP CCBs were determined. In addition, the mean total daily dose of lisinopril, losartan, and valsartan was calculated.

RESULTS: There were 1374 patients with a diagnosis of heart failure at the Dayton VAMC in fiscal year 2012. Of these patients, 633 patients were taking an ACE-I (46.07%), 167 patients were taking an ARB (12.15%), and 975 patients were taking a BB (70.96%). For medications not recommended, there were 194 patients taking NSAIDs (14.12%), 19 patients taking AAs (1.38%), and 76 patients taking NDHP CCBs (5.53%). The mean total daily dose of lisinopril was 21.388 mg, losartan 66.983 mg, and valsartan 259.642 mg.

CONCLUSION: In heart failure patients at the Dayton VAMC, just over half were prescribed an ACE-I or ARB with a greater proportion of patients receiving a BB. There was minimal utilization of medications with a relative contraindication in heart failure. This data will be useful for targeting a suboptimally treated population for additional intervention.

90. The clinical pharmacist's role in preventing osteoporotic fractures. Phase I: evaluating the screening and treatment practices for osteoporosis in a primary care practice.

Adriane Marino, Pharm.D.¹, Donald Nuzum, Pharm.D., BCACP, BC-ADM, CDE, CPP¹; (1) School of Pharmacy, Wingate University, Wingate, NC

OBJECTIVES: According to the 2010 National Osteoporosis Foundation (NOF) guidelines, bone mineral density (BMD) testing is indicated in all women age 65 and older and all men age 70 and older, regardless of their clinical risk factors. Treatment should be considered in patients with a hip or vertebral fracture, in patients with a T-score ≤ -2.5 at the femoral neck or spine after excluding secondary causes of osteoporosis, and in those with low bone mass (T-score between -1.0 and -2.5) and a 10-year probability of hip fracture $\geq 3\%$ or a 10-year probability of major osteoporosis-related fracture $\geq 20\%$. The review phase of this study was designed to evaluate the screening and treatment rates for osteoporosis in a primary care practice. This data will then be used to design and implement a pharmacist-managed osteoporosis service.

METHODS: Medical records of all women age 65 and older and all men age 70 and older who were seen in the clinic between January 1, 2011 and December 31, 2011 were reviewed. Patients' indications for screening and whether they were screened were assessed. Furthermore, data is being collected regarding indications for treatment and whether patients were treated.

RESULTS: BMD testing was indicated in all of the 1950 patients reviewed according to the NOF criteria; 15.85% (309) of those 1950 patients received dual-energy x-ray absorptiometry measurements. Data regarding treatment of osteoporosis is currently being evaluated and will be reported during the poster presentation.

CONCLUSION: Because osteoporosis is often under-diagnosed and as a result under-treated, many preventable fractures occur. The role clinical pharmacists can play in helping identify patients who meet criteria for BMD testing and facilitating medication management in order to reduce the risk of fracture is not well defined. Phase II of this study is being designed to implement a pharmacist-managed osteoporosis clinic in an effort to improve patient outcomes.

Cardiovascular

91. Prevention of stroke in patients with atrial fibrillation: a network meta-analysis comparing oral agents.

Abdullah Assiri, PharmD¹, Omar A. L. Majzoub, PharmD¹, Jennifer L. Donovan, PharmD¹, Abir O. Kanaan, PharmD¹, Matthew Silva, PharmD¹; (1) MCPHS University, Worcester, MA

OBJECTIVES: Warfarin and aspirin are used to prevent stroke in patients with atrial fibrillation (AF). However, they have inherent challenges such as inconsistent benefit with aspirin and increased bleeding and patient variability with warfarin. The development of new anticoagulants provides clinicians therapeutic alternatives. Using a network meta-analysis we sought to compare the safety and efficacy of new oral anticoagulants (rivaroxaban, apixaban, dabigatran, edoxaban) to current practice for the prevention of stroke in AF patients.

METHODS: A comprehensive and systematic literature search was conducted using multiple databases to identify all randomized trials comparing warfarin to rivaroxaban, apixaban, dabigatran, edoxaban, aspirin alone and in combination with clopidogrel in patients with AF. Studies were included if they evaluated any stroke or any bleeding events. Data were abstracted from the included articles, evaluated, and entered into ADDIS v1.14. to generate indirect comparison.

RESULTS: The literature search yielded 30 articles of which 21 met the inclusion criteria. All treatments except aspirin reduced the risk of any stroke when compared to placebo. Warfarin [0.43 (0.33–0.57)], apixaban [0.37 (0.27–0.54)], dabigatran [0.34 (0.21–0.57)], rivaroxaban [0.36 (0.22–0.6)] and aspirin with clopidogrel [0.73 (0.53–0.99)] were more protective than aspirin alone. Warfarin and the new anticoagulants were similar in the reduction of any stroke. There were no differences in major bleeding in any of the treatment groups. Non-major bleeding events were similar with warfarin and the new anticoagulants with the exception of apixaban, which resulted in fewer events than warfarin [0.55 (0.25–0.95)].

CONCLUSION: Our pooled analysis suggests that the new anticoagulants are similar to warfarin in the rate of any stroke and in non-major bleeding events, with the exception of apixaban, which was associated with a greater reduction in both outcomes compared to warfarin. Thus, the new anticoagulants may be a suitable therapeutic alternative in AF patients that can afford the cost of these agents.

92. Optimal anticoagulation target range in patients with nonvalvular atrial fibrillation by race/ethnicity.

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OBJECTIVES: Warfarin reduces the risk of stroke in patients with nonvalvular atrial fibrillation, with target International Normalized Ratio (INR) of 2–3 for all patients. Studies have included predominantly White patients; therefore, whether non-Whites gain similar benefit with no increased risk from the standard target INR is unclear.

METHODS: This was a retrospective study conducted at a large health maintenance organization in California. Patients were included in the study if they were >21 years old with active nonvalvular atrial fibrillation diagnosis between January 1, 2006 and June 30, 2009 and taking warfarin. Hemorrhagic and thromboembolic outcomes were analyzed. A subanalysis of warfarin-related events while patients were at target INR 2–3 was also performed.

RESULTS: During our study period, we identified 24,721 patients with active nonvalvular atrial fibrillation. A total of 712 hemorrhagic events and 39 thromboembolic events were found. Whites had 1.15 hemorrhagic events per 100 patient years. Compared to Whites, Blacks and Asians had significantly higher hemorrhagic events per 100 patient years (1.77, $p=0.0004$ and 1.73, $p=0.002$, respectively). Thromboembolic event rate per 100 patient years in each of the groups was the following: White, 0.069; Black, 0.07; Hispanic, 0.102, and Asian, 0. There were no statisti-

cally significant differences between any two groups compared with p -value of 0.29. In the subanalysis, a total of 188 hemorrhagic events were found at target INR 2–3. Whites had 0.419 events per 100 patient years. Compared to Whites, Asians had significantly higher hemorrhagic event rates at 0.895 events per 100 patient years ($p=0.0018$). There were no statistically significant differences comparing Whites with either Blacks or Hispanics.

CONCLUSION: Based on this study, in patients with nonvalvular atrial fibrillation, standard target INR 2–3 may not be appropriate for all ethnic groups, with Blacks and Asians having higher risk of hemorrhagic events compared to Whites.

93. The use of newer antiplatelet agents in secondary stroke prevention: a network meta-analysis. *Rhynn J. Malloy, PharmD Candidate¹, Matthew Silva, PharmD², Abir O. Kanaan, PharmD², Jennifer L. Donovan, PharmD²;* (1)School of Pharmacy, MCPHS University, Worcester, MA; (2)MCPHS University, Worcester, MA

OBJECTIVES: Current secondary stroke prevention guidelines recommend new antiplatelet therapies despite limited evidence. We conducted a network meta-analysis on data published between 2007 and 2012, to determine how the newer agents compare to contemporary practice.

METHODS: A comprehensive literature search was conducted to identify articles published between 2007 and 2012 that evaluated antiplatelet therapies for secondary prevention of stroke. Articles were included in the analysis if (1) had a JADAD score of >3 , (2) evaluated an antiplatelet therapy, and (3) had a common comparator group for analysis. Data were abstracted and entered into ADDIS (version 1.14.1). The analysis indirectly compared aspirin, cilostazol, terutroban, and sarpogrelate relative to each other for the recurrence of stroke and for any hemorrhagic events.

RESULTS: Five articles were included in the analysis. There were no differences in recurrent stroke with aspirin compared to cilostazol, terutroban, and sarpogrelate [Relative Risk (RR) 1.25 [Confidence Interval (CI) 0.84, 1.91], RR 0.98 (CI 0.66, 1.46), RR 0.80 (CI 0.51, 1.31), respectively]. There were more hemorrhagic events with aspirin compared to cilostazol [RR 2.35 (CI 1.08, 5.19)]; however, there were no differences in hemorrhagic events with aspirin compared to terutroban or sarpogrelate [RR 0.92 (CI 0.33, 2.51), RR 1.56 (CI 0.57, 4.44), respectively].

CONCLUSION: Alternative antiplatelet agents were not more efficacious than aspirin regarding recurrent stroke in this network meta-analysis. Aspirin was associated with more minor bleeding only in comparison with cilostazol, which is a weaker antiplatelet agent by comparison.

94. Risk and benefits of anticoagulation in patients with atrial fibrillation and chronic kidney disease. *Jamie Ky, Pharm.D., BCPS¹, Jennifer Polzin, Pharm.D., BCACP, FCSHP¹, Derenik Gharibian, Pharm.D.¹, Helen Chun, Pharm.D.¹, Jay Rho, Pharm.D., FCSHP¹, Albert Yuh-Jer Shen, MS, MD, FACC¹;* (1)Kaiser Permanente, Los Angeles Medical Center, Los Angeles, CA

OBJECTIVES: Atrial fibrillation (AF) and chronic kidney disease (CKD) both independently increase the risk of ischemic stroke. Previous retrospective study have only examined AF and end stage renal disease patients (ESRD). Thus, the use of warfarin in AF and CKD patients remains controversial in CKD Stage 4, 5, or patients on dialysis. To evaluate the risk and benefit of anticoagulation in patients with AF and CKD Stage 4, 5, or on dialysis.

METHODS: Retrospective patient chart reviews were conducted using electronic medical records to identify thromboembolic and hemorrhagic outcomes. Inclusion criteria were adults older than 21 years old, and had concurrently been diagnosed with AF and CKD stages 4, 5, or ESRD between January 1, 2006 and December 31, 2009. Patients excluded were those with valvular disease and prior kidney transplant. Outcome included thromboembolic and hemorrhagic events.

RESULTS: A total of 1548 patients were followed-up for a maximum of 6 years. During 1889 patient-years of follow-up in the no warfarin group, there were 55 primary outcome of stroke (2.91 events per 100 patient-years) and 93 secondary outcome of bleed (4.92 events per 100 patient-years). During 2885 patient-years of follow-up in the warfarin group, there were 81 primary outcome of stroke (2.81 events per 100 patient-years) and 192 secondary outcome of bleed (6.65 events per 100 patient-years). Overall, there was no statistical difference ($p=0.83$) between the two groups in terms of stroke rate. However, bleeding rate was significantly higher in the warfarin group ($p=0.016$).

CONCLUSION: Although there was some statistical differences in our baseline characteristics, CHADS₂ score were similar at baseline. The use of warfarin in patients with both AF and CKD may not provide additional benefits; rather, increase the risk of bleeding.

Community Pharmacy Practice

95. Perceptions of prescription drug warning labels within an underserved population. *Michelle Locke, BS, PharmD, Candidate¹, Olayinka Shiyabola, PhD¹, Brittney Meyer, PharmD¹, Sarah Wettergreen, BS, PharmD Candidate¹;* (1)South Dakota State University College of Pharmacy, Brookings, SD

OBJECTIVES: (1) Determine how prescription drug warning labels are used by underserved populations (2) Assess the challenges associated with interpreting drug warning labels (3) Examine the challenges associated with utilizing the information on prescription warning labels (4) Examine strategies needed to educate consumers about drug warning labels.

METHODS: The sample population was composed of adults from an underserved population who had a history of prescription medication use and who were able to understand English. Participants took part in a 15–20 minute semi-structured interview where they were presented with eight different prescription medications with a variety of attached drug warning labels. A health literacy assessment was done using the standardized Newest Vital Sign. Data analysis included descriptive statistics and chi-square analysis for all quantitative data and inductive thematic analysis for all open-ended questions.

RESULTS: One hundred and three participants completed the study. The mean age of participants was 50.25 years (SD = 18.05). Participants with adequate health literacy were more likely to mention the warning labels compared to those with lower health literacy ($p<0.05$). In addition, females were more likely to mention the warning label compared to men. For most labels, participants currently taking prescription medications were more likely to mention the warning labels compared to those not currently taking medications. Individuals with no insurance were more likely to rate prescription warning labels as extremely important compared to other insurance groups (57.61, $p=0.04$).

CONCLUSION: Prescription warning labels remain a valid method of communicating medication information, as long as they are easily comprehensible to patients. In addition to placing warning labels on prescription bottles, considerable efforts need to be made by health care providers to counsel underserved populations on medication warnings, especially men with lower health literacy receiving a new prescription.

96. Gluten status of the top 200 dispensed medications. *Anushri Gokhale, PharmD Candidate¹, Nick Carter, PharmD Candidate², Robert Beckett, Doctor of Pharmacy², Whitney Caudill, J. D.²;* (1)Drug Information Center, Manchester College of Pharmacy, Fort Wayne, IN; (2)Manchester College of Pharmacy, Fort Wayne, IN

OBJECTIVES: Gluten may be found in excipients, including starch. This study assessed the gluten content of the top 200 generic medications in order to aid pharmacists providing medication counseling to patients with celiac disease and other gluten contraindications.

METHODS: The July 2012 issue of *Pharmacy Times* was used to identify the top 200 generic medications, by manufacturer, dispensed in 2011; each product's excipients were verified using approved prescribing information. The manufacturer of each of the top 200 drug products of 2011 was contacted to verify whether the product was gluten-free and to specify the source of starch in their product, if applicable. Each drug was classified into one of four categories: proven gluten-free (i.e., absence of gluten verified by manufacturer), most likely gluten-free (i.e., not tested to verify absence of gluten; no excipients expected to contain gluten), possibly gluten-free (i.e., not tested to verify absence of gluten; source of excipients not verified gluten-free), and not gluten-free (i.e., known to contain gluten).

RESULTS: Of the top 200 dispensed medications, 11% were certified gluten-free. Seventy-four percent were considered most likely gluten-free and 11% were considered possibly gluten-free. Only two products were found to definitively contain gluten: lisinopril manufactured by Watson and nebivolol manufactured by Forest.

CONCLUSION: A relatively small percentage of medications were confirmed to contain or not contain gluten. The gluten status of the remaining products was inconclusive (i.e., most likely or possibly gluten-free); further testing on the part of pharmaceutical industry could help improve these results. Most likely, the majority of commonly dispensed generic medications are gluten-free; however, caution should be used when determining appropriateness of medications for patients with strict gluten contraindications.

Education/Training

97. "Está usted listo?": measuring the preparedness of Mississippi pharmacists to interact with Spanish-speaking populations. *Dylan Lindsay, BSPS¹, Richard Ogletree, Pharm. D.²*; (1) School of Pharmacy, University of Mississippi, Jackson, MS; (2) Department of Pharmacy Services, University of Mississippi Medical Center, Jackson, MS

OBJECTIVES: To determine if Mississippi pharmacists are aware of/have access to resources that would facilitate a successful interaction with a Spanish-speaking patient; to identify any gaps in knowledge, resources, or communication that might exist between MS pharmacists and the Spanish-speaking population; to make Mississippi pharmacists aware of areas for potential improvement concerning interactions that embody best care practices when dealing with Spanish-speaking patients

METHODS: This study was a cross-sectional questionnaire evaluating the knowledge of practicing pharmacists currently registered with the Mississippi Board of Pharmacy regarding available resources and restrictions as they relate to speaking and interacting with patients who speak Spanish. Questionnaires were distributed through an email contact list provided by the State Board of Pharmacy. Participants were asked a series of 13 close-ended questions regarding resources available to them to facilitate successful interactions with Spanish-speaking patients (e.g. phone translator services, Spanish dictionaries kept on hand, staff members fluent in Spanish, etc.).

RESULTS: Data currently undergoing analysis—no reportable results at this time.

CONCLUSION: Data currently undergoing analysis—no reportable conclusions at this time.

98. Pharmacist education and post-discharge follow-up for reducing heart failure readmissions. *Todd Belding, RPh¹, Vickie Poremba, PharmD², Margaret Malovrh, PharmD², Jennifer Baublitz, BSN, RN²*; (1) Department of Pharmacy, Sparrow Hospital, Lansing, MI; (2) Sparrow Hospital, Lansing, MI

OBJECTIVES: To determine the impact of pharmacist education and follow-up phone calls on readmission rates for heart failure patients.

METHODS: A pharmacist will identify patients admitted with acute heart failure exacerbation and collect information on demog-

graphics, heart failure status (EF, BNP) and current medications. The pharmacist will visit patients, explain the study, and request verbal consent. After consent is obtained, the pharmacist will educate the patient and/or caregiver on heart failure with an emphasis on medications (indication, administration, side effects). The pharmacist will provide a personalized medication calendar, a heart failure education packet, and a medication organization container. A follow-up phone call will be made 1–2 weeks post-discharge for pharmacist-educated patients. During the call, the pharmacist will ask questions about medications, inquire about adherence, and answer any medication-related questions. The study will be conducted over 6–9 months. All heart failure patients at Sparrow Hospital are currently educated by nurses, so a control group will be drawn from patients who were nurse-educated. The 30-day readmission rate for pharmacist-and-nurse-educated patients will be compared to the 30-day readmission rate for nurse-educated patients. Patient knowledge of medications, self-reported adherence, and length of education sessions and phone calls will be described. Exclusions are: pediatrics (age <18), patients in labor/delivery or maternity units, patients in intensive care (ICU, CCU, NCU), patients with cognitive impairment preventing education, residents of long-term care facilities, and patients who do not give consent.

RESULTS: As of January, 22 patients have been educated by a pharmacist and 13 have completed follow-up phone calls. The mean education time was 52 minutes, and the mean time spent on calls was 7.6 minutes. Thirty-three interventions were suggested, and 15 of these were accepted by prescribers. Further results are pending completion of the study.

CONCLUSION: N/A.

99. Income generating service learning project at Tumaini Children's Drop-In Center for street children in Eldoret, Kenya. *Chelsea Pekny, PharmD Candidate¹, Cynthia Herrera, PharmD Candidate², Rakhi Karwa, PharmD³, Monica L. Miller, PharmD⁴, Ellen Schellhase, PharmD⁵, Sonak Pastakia, PharmD, MPH⁶, Heather McKanna, PharmD Candidate⁶, Michelle Tharp, PharmD Candidate⁶*; (1) Purdue University, West Lafayette, IN; (2) College of Pharmacy, Purdue University, West Lafayette, IN; (3) College of Pharmacy, Purdue University, Indianapolis, IN; (4) Moi Teaching & Referral Hospital, Eldoret, Kenya; (5) Moi University School of Medicine, Eldoret, Kenya; (6) College of Pharmacy, Purdue University

OBJECTIVES: One consequence of urbanization is the number of children who call the streets home. Many children in developing countries leave their rural homes to seek opportunities in cities to support their families. Frequently, these children find themselves alone and without the jobs they were seeking. Without money for shelter or transportation home, these children find homes on the street with their peers where they lack education, food, shelter, and many basic rights. There are an estimated 3000 street children in Eldoret, and this number is expected to rise with upcoming political elections and continued urbanization. The Tumaini Children's Drop-In Center (TCDIC) was created to support this vulnerable population through providing education and skills training. Through the Purdue Kenya Pharmacy program, Purdue University student pharmacists have become involved with helping the TCDIC and developing income generation opportunities for street children.

METHODS: Student pharmacists worked with TCDIC staff to identify income-generating projects. Once projects were identified, the student pharmacists created educational programming to teach the children how to make each of the handicraft projects and identified needed supplies and costs. Start-up costs were provided through donations and grant funding.

RESULTS: Current projects include makings cards, beaded ornaments, bracelets, and lapel pins and selling t-shirts. The primary results of the income-generating project afforded three TCDIC children tuition for 1 year of boarding school and assisted several others with rent payments for safe housing. Revenue from the sale of TCDIC t-shirts allowed for the purchase of crafting mate-

rials. Profit generation will continue through t-shirt, card, ornament, bracelet, and pin sales.

CONCLUSION: Student pharmacist's continued efforts are crucial to the TCDIC's longevity. The income-generating project's sustainability is significant progress in alleviating the TCDIC's financial dependence on government-funded grants. These projects are valuable learning opportunities for student pharmacists and provide support to vulnerable children.

Emergency Medicine

100. Effect of blood glucose control in the emergency department on hospital length of stay. *Michaela Johnson-Clague, PharmD Candidate¹, Jessica DiLeo, PharmD Candidate¹, Jennifer Prze, PharmD Candidate¹, Michael Katz, PharmD¹, Asad E. Patanwala, PharmD, BCPS²; (1)The University of Arizona, Tucson, AZ; (2)The University of Arizona College of Pharmacy, Tucson, AZ*

OBJECTIVES: Current guidelines for inpatient hyperglycemia do not address the management of hyperglycemia in the emergency department (ED). The objective of this study was to evaluate the effect of early blood glucose correction on hospital length of stay.

METHODS: This was a retrospective cohort study conducted in an academic ED. Diabetics who presented to the ED with hyperglycemia between September 1st, 2011 and June 30th, 2012 were included. Patients were categorized into two groups based on blood glucose control achieved within the first 24 hours of ED triage: (1) blood glucose value 200 mg/dL or less (controlled group), (2) blood glucose value >200 mg/dL (uncontrolled group). The primary outcome of interest was a comparison in the hospital length of stay between the groups. This was compared between the two groups using the Wilcoxon rank-sum test. A multivariate regression analysis was performed to adjust for pertinent confounders.

RESULTS: A total of 161 patients were included in the final cohort (controlled = 81, uncontrolled = 80). The median age was greater in the controlled group than the uncontrolled group (57 vs 49 years, respectively; $p=0.005$). There were no other demographic differences between groups. The uncontrolled group had higher initial blood glucose than the controlled group (405 vs 264 mg/dL, respectively; $p<0.001$). There was no difference in median hospital length of stay between the two groups (3 vs 3 days, respectively; $p=0.299$). After adjusting for comorbidities (Charlson Co-Morbidity Index), severity of illness (Rapid Emergency Medicine Score) and initial blood glucose value in the multivariate analysis, blood glucose control was not significantly associated with hospital length of stay (coefficient = 1.600, $p=0.137$).

CONCLUSION: Blood glucose control in the ED is not associated with hospital length of stay. Therefore, blood glucose management may be deferred until hospital admission, while more emergent issues are managed in the ED.

101. Hypoglycemic events among Veterans with diabetes presenting to the emergency department: a descriptive analysis. *Natalie Noto, PharmD¹, Marci Salow, PharmD¹, Allison M. Paquin, PharmD¹, Errol Baker, PhD¹, Jane Driver, MD, MPH¹, Stephan Gaehde, MD, MPH¹; (1)Veterans Affairs Boston Healthcare System, Boston, MA*

OBJECTIVES: Hypoglycemia, which can lead to falls, coma, and death, is one of the most common preventable causes of emergency department (ED) visits. In order to develop targeting criteria for a future pharmacist-led intervention, this study will identify factors that place Veterans with diabetes at a greater risk for serious hypoglycemic events that require treatment in an ED.

METHODS: This retrospective, matched-group cohort study is being conducted via chart review of Veterans with diabetes who presented to the ED at a large Veterans Affairs medical center between January 1, 2006 and December 31, 2011. Subjects with a discharge diagnosis of hypoglycemia (study group) will be compared to diabetic subjects without this diagnosis (control group). Data collection in progress includes: medical history, lab values,

diabetes management and primary care clinic appointments, and anti-diabetic medication regimens.

RESULTS: The search criteria identified 214 subjects with an ED discharge diagnosis of hypoglycemia. A preliminary analysis of 25 random subjects has been completed. All subjects were male with a mean age of 68.7 years, of which 28% ($n=7$) were over age 80. The mean Hemoglobin A1c was 7.24%. The most common drug regimens were insulin alone ($n=13$, 52%) and oral agents with insulin ($n=8$, 32%). Coronary artery disease ($n=17$, 68%) and retinopathy (68%) were the most frequently noted existing complications.

CONCLUSION: Early findings suggest patients who present to the ED for hypoglycemia have insulin in their drug regimens, have relatively good glycemic control, and have existing evidence of microvascular and macrovascular damage. Full analysis for this research in progress is anticipated to conclude in April. Study findings will be used to identify risk factors for hypoglycemia in order to target and prevent it.

Endocrinology

102. Evaluation of an etomidate infusion protocol for the management of hypercortisolism in Cushing's syndrome. *Nicole Kelly, PharmD Candidate 2013¹, William Peppard, PharmD, BCPS¹, David Herrmann, PharmD¹; (1)Froedtert Hospital, University of Wisconsin-Madison School of Pharmacy, Milwaukee, WI*

OBJECTIVES: Etomidate suppresses adrenal steroidogenesis by inhibiting the catalyzing enzyme 11-beta-hydroxylase. Intravenous etomidate for endogenous Cushing's syndrome has been utilized to rapidly manage consequences of hypercortisolism and lower perioperative serum cortisol. This study aims to evaluate the efficacy and safety of an etomidate infusion protocol for the normalization of hypercortisolism related to Cushing's syndrome.

METHODS: A descriptive retrospective chart review of patients admitted to Froedtert Hospital between January 2008 and January 2013 was conducted to evaluate an etomidate infusion protocol. The primary outcome was normalization of serum cortisol following the etomidate infusion protocol. Secondary outcomes were final cortisol level achieved, rate of cortisol change, maximum infusion rate, and adverse effects.

RESULTS: The protocol was applied on four occasions in three patients for Cushing's syndrome. In three of the four cases, cortisol normalization was achieved (75%). Normalization of hypercortisolism due to ectopic ACTH secretion did not occur in one patient, because etomidate was held to address acute hypotension, atrial fibrillation and the patient's worsening metastatic cancer. In the patients that achieved cortisol normalization, mean minimum cortisol was 13.00 $\mu\text{g/dL}$ (SD 2.26). In all cases, mean rate of cortisol change was 1.46 $\mu\text{g/dL/hour}$ (SD 1.16). The maximum etomidate infusion rate was below doses required for sedation (mean 0.073 mg/kg/hour, SD 0.038), and no adverse effects were reported.

CONCLUSION: Based on current experience, the etomidate infusion protocol established at Froedtert Hospital is safe and effective for the management of hypercortisolism related to Cushing's syndrome. Ongoing banking of data and evaluation of the protocol for quality control purposes will provide additional insight into protocol effectiveness. Based on the growing surgical oncology department at Froedtert Hospital, it is anticipated that at least four patients will use this protocol in the coming twelve months. At that time a student colleague will complete data analysis.

103. Safety, efficacy, and satisfaction with U-500 regular insulin in Veterans with type 2 diabetes. *Kristine Kern, PharmD¹, Allison Brenner, PharmD², Kathryn Hurren, PharmD, BCACP²; (1)Pharmacy Department (119), VA Ann Arbor Healthcare System, Ann Arbor, MI; (2)VA Ann Arbor Healthcare System, Ann Arbor, MI*

OBJECTIVES: To evaluate the safety, efficacy, and patient satisfaction with U-500 regular insulin in veterans with type 2 diabetes mellitus (T2DM). U-500 regular insulin is five times more concentrated than U-100 regular insulin and may be useful in patients with very high insulin requirements.

METHODS: Veterans with T2DM prescribed U-500 regular insulin between January 2008 and August 2012 were identified. Subjects who used U-500 insulin for at least six months and had HbA1c available at baseline (within six months of U-500 insulin initiation) were included. Patients who lacked HbA1c during the study period, used an insulin pump, were initiated on high dose corticosteroids (defined as >10 mg of prednisone or equivalent dose for >14 days), or had U-500 insulin regimen interrupted for >14 days were excluded. Patients currently prescribed U-500 insulin were contacted by telephone to participate in the patient satisfaction and quality of life survey. Primary endpoint was change in HbA1c from baseline (defined as initiation of U-500 insulin) to 6 months. Secondary endpoints included change in HbA1c from baseline to 3 and 12 months; assessment of patient satisfaction and quality of life while using U-500 insulin compared to U-100 insulin; change in body weight, total daily insulin dosage, number of insulin injections per day from baseline to 3, 6, and 12 months; incidence of hypoglycemia 6 months before and after initiating U-500 insulin.

RESULTS: Of 59 subjects, 49 met inclusion criteria for retrospective chart review. Thirty-nine subjects were eligible to participate in the patient satisfaction and quality of life survey. Data collection is complete for 34 subjects. Study population was 98% male with mean (\pm SD) age of 59.9 ± 8.1 years. Mean HbA1c was $9.5 \pm 1.6\%$ and $8.0 \pm 1.3\%$ at baseline and 6 months, respectively. Anticipate data analysis will be complete in February 2013.

CONCLUSION: To be presented at ACCP Virtual Poster Symposium.

104. Factors associated with attainment of diabetes-related behavior goals. *Damika Watley, Pharm.D. Candidate¹*, Michael Williams, Pharm.D. Candidate², Oluwaranti Akiyode, Pharm. D., BCPS, CDE^{1,2}, Mary Maneno, Ph.D.^{1,2}; (1)Department of Clinical and Administrative Pharmacy Sciences, Howard University College of Pharmacy, Washington, DC; (2)Howard University College of Pharmacy, Washington, DC

OBJECTIVES: To identify factors that influence patients' attainment of their diabetes self-management education behavioral goals. The patients established behavior goals regarding nutrition, blood glucose monitoring, and/or physical activity at the beginning of a 3-day self-education training class intended to improve their diabetes outcomes.

METHODS: A retrospective chart review of the achievement of goals set by 30 diabetes patients who attended the training class at an outpatient diabetes treatment center was conducted. Patient follow-up was conducted via telephone after completion of the diabetes class during the period of September 2011 to August 2012 to ascertain the achievement of their behavior goals. The collected data for this study included patients' rankings of attained behavior goals (i.e. always, most of the time, some of the time, never), age, race, gender, and the number of class days attended.

RESULTS: The patients' ages ranged from 35.9 to 78.7 years, with a mean age of 58.6. All of the patients identified themselves as Black/African American. Of the patients, 43.3% were male (n=13), and 56.7% were female (n=17). Majority of patients (80%; n=24) attended all three days of training; 13.3% (n=4) attended two days, and 6.7% (n=2) attended only one day. There were a total of 80 goals set by all 30 patients over the study period. The patients responded as follows regarding attainment of their goals: always (32.5%), most of the time (26.3%), some of the time (36.3%), never (6.3%).

CONCLUSION: Research is still ongoing. A full SPSS analysis of the collected data is pending to assess possible statistical significance of the associated factors on the attainment of behavior goals. An anticipated completion date for the study is April 30, 2013.

Gastroenterology

105. Impact of a screening and education program on the rates of Hepatitis A and B vaccinations in veterans infected with Hepatitis C. *Andrew Siler, Pharm.D.¹*, Jennifer Stark, Pharm.D. BCPS¹, Marcus Costner, Pharm.D. BCPS¹; (1)Pharmacy Department, Veterans Health Care System of the Ozarks, Fayetteville, AR

OBJECTIVES: The primary objective of this study was to evaluate the extent to which a clinical pharmacist run screening and education program can increase Hepatitis A (HAV) and Hepatitis B (HBV) vaccination rates in chronic Hepatitis C (HCV) infected veterans.

METHODS: A retrospective chart review is being performed to assess rates of HAV and HBV vaccinations in chronic HCV patients. Vaccination rates will be assessed before and after a new process is introduced to an outpatient hepatitis clinic. The new process will employ automatic consultations on chronic HCV patients to a clinical pharmacist for screening and identification of those lacking documented HAV/HBV immunization along with other appropriate baseline laboratory needs prior to initiation of HCV antiviral therapy. Clinical pharmacists will facilitate appropriate scheduling of vaccinations and provide weekly patient education sessions to increase awareness of the importance of HAV and HBV vaccinations in this population.

RESULTS: The baseline rate of veterans who were appropriately vaccinated, had documented immunity to HAV and HBV, or were on track to be appropriately vaccinated for both HAV and HBV was 15/41 (38%). The study is currently in progress. Results of the vaccine rates in patients following initiation of the clinical pharmacist screening and education program will be reported during the poster symposium.

CONCLUSIONS: Preliminary results reveal underutilization of recommended hepatitis A and B vaccines in patients with chronic hepatitis C. Final results will help identify useful processes to improve hepatitis A and B vaccination rates in chronic hepatitis C patients.

Geriatrics

106. Impact of a novel patient-centered pharmacy model in long-term care. *Melanie McKain, PharmD.¹*; (1)Mylan School of Pharmacy, Duquesne University, Pittsburgh, PA

OBJECTIVES: Traditional consultant pharmacy services in long-term care are generally limited to monthly retrospective drug regimen review as required by regulations. We describe the impact of a proactive, patient-centered, interprofessional approach to medication review for long-term care. The purpose of this study was to evaluate the process outcomes, specifically the number of patients reviewed, number and type of recommendations made, and acceptance rate of recommendations in order to identify the impact of a novel clinical pharmacy service in the long-term care setting.

METHODS: This study involves clinical pharmacy services offered at a single nursing facility. These services include medication reconciliation upon admission, anticoagulation monitoring, pain monitoring, antibiotic monitoring, falls reviews, behavior monitoring, and response to specific pharmacy consults. Each service, type of recommendation, and outcome (acceptance, denial, or lost to follow-up) of recommendations were documented. Data from July 2012 through December 2012 were assessed. Descriptive statistical methods were performed for all data analysis.

RESULTS: Preliminary data from the first 4 months shows that 175 new admission reviews, 101 antibiotic reviews, 58 pain reviews, and 84 requested reviews were conducted. Ninety recommendations resulted from admission reviews, 13 from antibiotic reviews, four from pain reviews, and 68 from requested reviews. The overall acceptance rate of recommendations for all services combined was 71%. Data from other services has not yet been analyzed. Comprehensive results expected by the beginning of February 2013.

CONCLUSION: Preliminary workload statistics suggest that the service has a significant impact demonstrated by a large number of reviews conducted, recommendations generated, and acceptance rate of recommendations. The high acceptance rate also suggests that the recommendations are well-received by physicians.

HIV/AIDS

107. Evaluation of antiretroviral prescribing error rates and potentially associated risk factors at hospital discharge: preliminary 12-month results. *Kenneth Brennan, Pharm.D. Candidate 2015*¹, Sandy Moreau, Pharm.D., BCPS¹, Michael Curci, Pharm.D.², Adriana Grigoriu, MD², Nan Rao, Pharm.D., BCPS³; (1) Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ; (2) Jersey City Medical Center, Jersey City, NJ; (3) Virginia Mason Medical Center, Seattle, WA
OBJECTIVES: The objectives of this evaluation are to identify antiretroviral therapy (ART) and opportunistic infection (OI) prophylaxis prescribing errors occurring at hospital discharge for clinic HIV patients and identify potential risk factors associated with these errors.

METHODS: Retrospective chart review of hospitalized HIV clinic patients from March 2010 to March 2012 was performed to determine ART and OI prophylaxis prescribing errors. Error rates and types are based on 2012 National HIV guideline. Patients included had received care at outpatient HIV clinic within 6 months of hospital admission, were on outpatient antiretroviral regimen, were admitted to the general medical floor of the hospital, and were taking medications by mouth for at least 48 hours prior to discharge. Patients with hospital documentation to discontinue ART indefinitely were excluded.

RESULTS: Preliminary results from March 2010 to February 2011 included 104 patients meeting criteria. At least one prescribing error occurred at discharge in 59 patients (57%). Of 90 patients with correct ART and OI prophylaxis regimen during hospitalization, discharge error rate was 52%. Of 14 patients with incorrect inpatient regimen that was never resolved, discharge error rate was 86%. Most patients were admitted under General Medicine and had a discharge error rate of 50% (37 out of 74). There were 68 errors by error type, including 32 ART omissions (47%); 15 ART dosing errors (22%); six ART contraindications (9%); 14 OI prophylaxis omissions (21%); and one OI prophylaxis dosing error (1%). With the completion of the retrospective review, it is expected that potential risk factors for medication error will be evaluated.

CONCLUSION: Medication errors remained common at hospital discharge, despite a high percentage of patients with correct inpatient medication regimens. Preliminary results highlighted the need to improve ART medication reconciliation process at hospital discharge and perform targeted system-based interventions and provider education.

Infectious Diseases

108. Inducibility and characterization of oxacillin susceptible *mecA* gene positive *Staphylococcus aureus* obtained from outpatient wounds. *Megan Kehrl, Pharm.D*¹, Mary Ann Henthorne, MLS (ASCP)¹, Christopher Penn, MD¹, Patrick Parker, MSP, RPh¹, Isabella Tickler, BS¹; (1) Pharmacy, Lawrence Memorial Hospital, Lawrence, KS

OBJECTIVES: Methicillin resistance in *Staphylococcus aureus* (*S. aureus*) is generally due to the presence of the *mecA* gene. Using polymerase chain reaction (PCR) testing, our hospital microbiology laboratory recently discovered methicillin sensitive *S. aureus* (MSSA) strains containing the *mecA* gene. After exposing the organisms to cefoxitin induction, the *mecA* gene in these isolates was induced, resulting in beta-lactam resistance. *Staphylococcal protein A* (*spa*) typing was performed, and the strain of the inducible organisms found was t175. The purpose of this study was to determine the prevalence of inducible methicillin resistance in *S. aureus* obtained from patients with outpatient wounds. It

was also designed to discover how often the same strain presents as MSSA (not yet induced) and how often as MRSA (already induced).

METHODS: *S. aureus* isolates obtained from outpatient wounds were examined by routine susceptibility and PCR testing for the presence of the *mecA* gene, the *Staphylococcal chromosome cassette mec* (*SCCmec*) element, and the *spa* gene. Starting June 6, 2012, the first 75 MSSA and 97 MRSA isolates were sent to a molecular diagnostics laboratory for *spa* typing. As of November 1, 2012, PCR testing was performed on an additional 72 MSSA isolates.

RESULTS: Susceptibility testing found 135 MSSA isolates. Of these, zero were *mecA* positive. The t175 strain of *S. aureus* was not detected in the isolates studied.

CONCLUSION: If a laboratory tests for MRSA using only phenotypic susceptibility methods, an inducible MRSA may be overlooked. The results indicate inducible MRSA occurs infrequently in the region. However, it provides baseline data against which to compare future research.

Medication Safety

109. Evaluation of substituting epinephrine auto-injectors for intravenous epinephrine to reduce medication errors in the emergency department. *Monique Mounce, B.S., PharmD Candidate*¹, Bryan Hayes, PharmD, DABAT²; (1) School of Pharmacy, University of Maryland, Baltimore, MD; (2) Medical Center, University of Maryland, Baltimore, MD

OBJECTIVES: A medication error involving epinephrine for anaphylaxis prompted an emergency department (ED) to remove epinephrine 1-mL vials (1:1000) and stock epinephrine auto-injectors to reduce preventable medication errors caused by minimizing stocking multiple concentrations of the same drug product. ED nurses were trained on the proper administration technique of the auto-injector pen. The primary objective was to evaluate the retention of the administration technique training. Secondary outcome measures included number of auto-injectors administered and finger sticks from improper use.

METHODS: Two months following the initial auto-injector training sessions, we surveyed a convenience sample of ED nurses (n=18) to assess their ability to properly administer the epinephrine pen using a training auto-injector. A standard examination form was created to assess all six steps indicated by the manufacturer. The quantity of auto-injectors utilized was reported by compiling the Omnicell[®] pharmacy records. Accidental finger sticks were examined by reviewing adverse event reports.

RESULTS: During the auto-injector technique assessment, only seven nurses (38.9%) demonstrated perfect technique, which was considered correctly demonstrating six out of six steps. Four nurses (22.2%) incorrectly held the needle tip away from the patient. Three out of these four errors would have resulted in an accidental finger stick. Between May and October 2012, 31 epinephrine auto-injectors were administered in the adult ED and there was no reported finger sticks.

CONCLUSION: Apparent fixes to medical errors can occasionally result in subsequent new and unforeseen errors. In this evaluation, we examined the substitution of auto-injectors to deliver epinephrine for anaphylaxis in the ED instead of stocking two intravenous concentrations. Although the auto-injector might reduce confusion and the need to conduct calculations and mixing, our results show that uncommonly used medication devices, such as epinephrine auto-injectors, should require some form of nursing continuing education to ensure safe and effective use.

110. Discrepancies in transition of care for high alert medication warfarin. *Aditi Shah, Pharm.D*¹; (1) Department of Pharmacy, Sinai Hospital of Baltimore, Baltimore, MD

OBJECTIVES: Warfarin is the most prescribed oral anticoagulant drug in the United States, and oral anticoagulants are one of the most common drugs associated with adverse events during the transition of care process. Due to the narrow therapeutic index and associated side effects of warfarin, it is considered to be a high alert or high risk medication. Therefore, it is crucial to

determine the accuracy of the medication reconciliation process for Sinai Hospital's anticoagulation clinic patients maintained on warfarin that are readmitted to the hospital or present to the Emergency Department (ED).

METHODS: Medical records of anticoagulation clinic patients who were readmitted to the hospital or presented to the ED were reviewed prospectively over a 3-month period. Patients included were those who had a recent anticoagulation clinic visit (within last 3 months). Data was collected in order to assess the accuracy of the medication reconciliation process by comparing the patient's home warfarin dose as prescribed by clinic to dose charted on readmission. The primary endpoint of this study was to find the percent of patients who had multiple different warfarin doses recorded in their chart on admission.

RESULTS: A total of 83/127 (65.35%) of the doses went uncharted. Of the remaining 34.65% of patients with charted doses, 22.05% of these doses were incorrect or different from home doses prescribed per anticoagulation clinic.

CONCLUSION: A better documentation process needs to transpire in order to capture home warfarin doses as 65.35% of the doses went uncharted. This leaves a significant room for error, especially when INR's are uncharted and possibly leading to bleeding or thromboembolic events with increased hospital costs.

111. Optimization of order verification in a multihospital healthcare system with computerized provider order-entry (CPOE). Theresa Crnic, PharmD, BCPS¹; (1)Department of Pharmacy Services, Aurora Health Care, Milwaukee, WI

OBJECTIVES: In 2010, Aurora Health Care (AHC) embarked on a 3 year plan to implement an integrated electronic medical record (EMR) and clinical software system including computerized provider order-entry (CPOE) and a range of clinical and operational applications. Despite reports of efficient order processing and reduced transcription errors with CPOE-integrated EMRs and clinical software systems, AHC pharmacists reported increased interventions and decreased efficiency associated with order entry errors, system "build" errors, and manipulation of order administration start times for non-time critical medications (currently default 15 minutes from time order written). The objective of the study was to evaluate impact of a 2-hour order start time delay on reducing the number of medication orders modified by a pharmacist upon verification.

METHODS: The study examined medication orders from six AHC hospitals operating on the new clinical software system for at least 1 month. A total of 239,456 medication orders were collected and analyzed before (n=129,895) and after (n=109,561) implementation of a 2-hour start time delay. Data analyzed included order name and identification, the presence or absence of changes made by a pharmacist to modifiable order fields, including order start time, order frequency, and first dose start time. Data collection and analysis will continue to identify interventions and their impact on reducing the number of medication orders requiring pharmacist modification.

RESULTS: A mean 7521 medications orders were verified by a pharmacist per day. The number of medication orders modified before implementation of the 2-hour start time delay was a mean 1109 orders per day. After implementation, the mean number of orders modified was reduced to 1005 orders per day.

CONCLUSION: Implementation of a 2-hour order start time delay reduced the mean number of medication orders modified by a pharmacist by 9.4%. The impact of additional interventions will be assessed on an ongoing basis.

Pain Management/Analgesia

112. Role of gabapentin in postoperative pain after total knee arthroplasty (TKA). Megan Germer, PharmD, MPH¹, Stephanie Porto, PharmD, BCPS¹, Joseph Gant, PharmD¹, Monica Blanton-Birzer, PA-C¹, Richard Wendt, MD¹, Michael Oszko, PharmD, BCPS¹; (1)Department of Pharmacy, Lawrence Memorial Hospital, Lawrence, KS

OBJECTIVES: Opioids are the traditional treatment for postoperative pain after TKA; however, opioids may not be fully effective for movement-associated pain and often cause side effects. The purpose of this study is to determine whether gabapentin decreases postoperative opioid consumption when part of a multimodal analgesic regimen in TKA patients.

METHODS: The institutional review board approved this prospective case-control study. Men and women aged 21-75 who provide informed consent are enrolled if they have a diagnosis of osteoarthritis of the operative knee(s). Patients are matched to a historical control based on age, gender, BMI, and operative knee (s). Patients receive 800 mg of gabapentin 1-2 hours before surgery, then 600 mg twice daily until discharge beginning 8-12 hours after surgery. The primary outcome measure is total opioid consumption. Secondary outcomes include pain control, postoperative length of stay, and adverse effects. It was determined that 35 participants in the treatment group would yield 80% power to detect a difference of 20 mg of total opioid use (in morphine equivalence) between groups for the primary outcome.

RESULTS: Study patients use less postoperative opioids compared to control patients (n=8). Pain scores are also lower in the treatment group and at or below comfort goal for a larger percent of time. There is no difference in postoperative length of stay; however, 75% of control patients experienced nausea/vomiting compared to 0% of study patients.

CONCLUSION: Although the reported outcomes are very preliminary, there is a trend towards decreased opioid consumption and improved pain control when gabapentin is part of a TKA postoperative pain regimen. If proven to be useful in the setting of TKA, this may be applicable to other orthopedic procedures.

Pediatrics

113. Internet analysis of alternative child immunization schedules.

Erin Beattie, PharmD Candidate¹, Emily T. Martin, MPH, PhD²; (1)Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI; (2)Wayne State University Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, MI

OBJECTIVES: Parents are increasingly choosing to use alternative immunization schedules for their children. An alternative immunization schedule is one that recommends delay or omission of immunizations when compared to the Centers for Disease Control (CDC) child immunization schedule. Little research has been conducted to characterize internet sources of vaccine information, particularly those that promote alternative schedules. This survey of websites was designed to find suggested child immunization schedules and compare them to CDC recommendations.

METHODS: An internet search was done using the following search terms (Google[®]): "Alternative immunization schedule", "alternative vaccine schedule", "delayed immunization schedule", and "delayed vaccine schedule". The first two pages of results for each term were classified as "pro-alternative", "anti-alternative", or neutral. Vaccines recommended by kindergarten were summarized.

RESULTS: Nine alternative schedules were identified from 25 unique webpages. Eleven were classified as anti-alternative immunization sites, 11 as pro-alternative and three as neutral. The schedules varied greatly in the recommendations and ranged from full but delayed coverage of CDC recommended immunizations to no immunization. Alternative schedules range in number of required doctor visits (8-23) and number of diseases covered (6-14) by the beginning of kindergarten. Of the nine alternative schedules identified, only one included completion of all CDC recommended vaccinations for all disease states by kindergarten. The CDC schedule requires 12 visits and covers 14 disease states by kindergarten.

CONCLUSION: The alternative schedules identified may require more doctor visits and may not fulfill kindergarten immunization requirements. Our analysis of internet-based information will be completed March 2013.

114. Cross contamination risk following implementation of a common canister protocol at a children's hospital. *Renee Baylor, PharmD¹, Tara Smith, PharmD², Okan Elidemir, MD²*; (1)Department of Pharmacy, Sacred Heart Children's Hospital, Pensacola, FL; (2) Sacred Heart Children's Hospital

OBJECTIVES: Common canister protocols (CCP) have been shown to significantly reduce waste and expenses associated with delivery of aerosolized medications to patients while hospitalized. However, minimal evidence-based, peer-reviewed data on the risks of microbial cross contamination through shared metered dose inhalers (MDI) is available. Literature search reveals that there is no standardized sanitation protocol available. Our objective was to show that implementing our own common canister protocol at our institution would decrease costs associated with MDI therapy without exposing patients to increased risk of cross contamination.

METHODS: Eligible participants are inpatients receiving 1+ inhaled MDI medications, excluding any patients on mechanical ventilators or isolation precautions. During phase one, MDI canisters were dispensed for individual patients and cultured following use daily. All samples were plated, incubated for 48 hours, and analyzed by a clinical microbiologist. Phase two began after 10 samples were obtained in phase one and bacterial contamination risk was determined to be negligible. During phase two, MDI canisters were shared between patients. Respiratory therapy staff stores MDIs and sanitizes them with 70% isopropyl alcohol before and after each use. Canister mouthpieces were cultured on a regular schedule for 3 months and sporadically afterwards to continue to monitor cross-contamination risk following implementation of common canisters. Costs associated with actual MDI were calculated for the study period and compared to theoretical cost of individual inhalers for the same time period to show financial savings.

RESULTS: Phase one pending cultures show no growth to date. Use of MDI treatments is currently high enough to have sufficient samples available by the end of the study period.

CONCLUSION: n/a.

Pharmacoeconomics/Outcomes

115. Using a peer educator to link patients to medication supply chain improvements in western Kenya. *Stephanie Lukas, PharmD, MPH^{1,2}, Imran Manji, BPharm^{1,2}, Beatrice Jakait, BPharm^{1,2}, Sonak Pastakia, PharmD, MPH^{1,2,3}*; (1) College of Pharmacy, Purdue University, Indianapolis, IN; (2) Moi Teaching & Referral Hospital, Eldoret, Kenya; (3) School of Medicine, Moi University, Eldoret, Kenya

BACKGROUND: A Revolving Fund Pharmacy (RFP) model was implemented at AMPATH in an effort to consistently provide medications to patients in western Kenya. Medication are sold at a small mark up and revenue is used to continuously resupply medications. However, when it began, nearly half of prescriptions written were not taken to the RFP, so patients went without medications or bought them in the private sector where drugs are higher priced and of indeterminate quality.

OBJECTIVES: To increase patients' knowledge, understanding, and use of the RFP through peer education thereby increasing their access to quality, low-cost medication.

METHODS: A peer educator was hired to circulate through patient waiting areas to explain the RFP model. Communicating with and educating patients is vital, answering questions and facilitating understanding of RFP's purpose and the importance of payment for sustainability. To increase comprehension, fliers were created for peer educator to use.

RESULTS: With education, patients have shown a great interest in the success of the RFPs. Within weeks, sales already increased, and after a drop related to a doctor strike, they continue to rise. Patients have expressed appreciation for the opportunity to have their questions answered and have come to appreciate the value of the RFP.

CONCLUSION: It is important to remember, just because an improved supply chain system is created does not mean patients will automatically use the system. Involving the patients is a key factor both for the community's public health and for the success of a RFP. The peer educator has had a positive impact on patients, increasing their acceptance and understanding, and the revenue generated by an increase in prescriptions will likely be enough to cover the peer educator's salary. Most importantly, an increase in prescriptions filled at the RFP means an increase in our patients' access to quality, low-priced medications.

Pharmacogenomics/Pharmacogenetics

116. Psychological and genetic predictors of pain tolerance. *May Li, PharmD Candidate¹, Keith Walsh, PharmD Candidate¹, Marina Martinez, BS¹, Sarah Baker, BS¹, Eric Snyder, PhD², Asad E. Patanwala, PharmD, BCPS³*; (1) The University of Arizona, Tucson, AZ; (2) The University of Minnesota, Minneapolis, MN; (3) The University of Arizona College of Pharmacy, Tucson, AZ

OBJECTIVES: The perception of pain and analgesic response can be influenced by a variety of patient specific factors, including genetics. Previous studies evaluating the genetic contribution to pain tolerance have not incorporated patients' psychological characteristics. The objective of this study was to determine the influence of psychological and genetic predictors of pain tolerance when studied in combination.

METHODS: A total of 89 healthy adults completed two questionnaires, the Pain Catastrophizing Scale (PCS) and the Fear of Pain Questionnaire (FPQ-III). Cheek swabs were taken for genetic analysis of six single nucleotide polymorphisms (SNPs) within the following three genes: TRPA1 (rs11988795), COMT (rs4646312, rs6269), and FAAH (rs932816, rs4141964, rs2295633). These SNPs were found to be most promising based on previous research. Subjects then completed a cold-pressor test in which their non-dominant hand was inserted up to the wrist in a circulating water bath that was maintained at 1–3°C. The primary outcome measure was pain tolerance, which was defined as the duration of time subjects were able to leave their hand in the water. Linear regression analysis was used to identify predictors of pain tolerance.

RESULTS: The subjects had a mean age of 26 ± 7 years and 58% were female. The majority of the subjects were Caucasian (51%), followed by Asian (26%), Hispanic (14%), and other (9%). In the overall cohort, the mean pain tolerance was 121 ± 66 seconds. In the regression analyses, female sex ($p=0.001$), Asian race ($p=0.001$), PCS score (<0.001) and FPQ-III score ($p=0.014$) were associated with a decreased pain tolerance. None of the SNPs were predictive of pain tolerance.

CONCLUSION: Psychological factors and patient demographics are associated with pain tolerance. However, there was no relationship between pain tolerance and the SNPs evaluated. Future genetic studies evaluating pain should incorporate a psychological assessment, to adjust for this important confounder.

Psychiatry

117. Monoamine oxidase inhibitors combined with other antidepressant medications: a case series. *Samantha Thomas, Pharm.D. Candidate 2014¹, Mirae Shin, Pharm.D.², Melvin McInnis, M.D.², Jolene Bostwick, Pharm.D., BCPS, BCPP²*; (1) College of Pharmacy, University of Michigan; (2) University of Michigan Health System

OBJECTIVES: This case series reviewed patient cases in which monoamine oxidase inhibitors (MAOIs) were used in combination with other antidepressants in order to (1) describe and evaluate the outcomes when combination therapies have been used, (2) determine the cause of adverse reactions and assess for confounding variables that may have been contributing factors, and (3) share experiences of these patients in order to add to the literature on MAOI combination therapy in individuals with treatment resistant depression.

METHODS: Information was gathered from the medical charts of 29 patients treated with an MAOI in combination with one or more antidepressants at a large, Midwestern academic hospital. Data including patient demographics, indication, past medication trials, duration of therapy, other serotonergic medications, tolerability, symptom control, and reasons for discontinuation were documented and reviewed.

RESULTS: Combinations used include MAOI + mirtazapine (1), MAOI + TCA (4), MAOI + trazodone (16), MAOI + SSRI (1), MAOI + bupropion (2), and MAOI + 2 other antidepressants (5). A total of six patients received combination therapy with improvement in mood and no or minimal/tolerable adverse effects. Adverse effects resulted in discontinuation in 10 patients, including three possible cases of serotonin syndrome. Other

known reasons for discontinuation include lack of benefit or effectiveness, increased suicidality, patient decision, and preparation for ECT.

CONCLUSION: Inadequate response to standard antidepressant medications is common and combined therapeutic approaches are frequent. This review of combined MAOIs with other antidepressants found that 20% of patients improved significantly with no complications and 30% showed side effects that required discontinuation of the MAOI. The remaining patients tolerated the combination well, but with modest improvement in mood. The estimated completion date of this study is March 2013.