

2018 ASHP Midyear Clinical Meeting Professional Poster Abstracts

Session-Board # - 1-001

Poster Title: Implementation of a primary prevention, population-based virtual osteoporosis clinic dramatically increases the number of rural veterans receiving osteoporosis screening and treatment

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Osteoporosis is a silent, treatable, chronic condition that is underdiagnosed and undertreated both nationally and within the Veteran Affairs (VA) Healthcare system. Men account for 29 percent of fragility fractures, 25 percent of total costs, and have a significantly higher mortality rate than women, with one in three older men dying within one year after a hip fracture. The delivery of osteoporosis services is sub-optimal nationally and throughout the VA and particularly poor for rural Veterans. To meet this critical need, we developed a Rural Bone Health Team (BHT), to provide efficient, evidence-based primary prevention osteoporosis services to rural Veterans.

Methods: Adapted from the Patient-Aligned Care Team (PACT) model, the Rural BHT consists of a physician-led team and includes two program support assistants, two clinical nurse educators, and two APPs, including a Clinical Pharmacy Specialist. To identify Veterans with osteoporosis risk factors, we operationalized evidence-based screening guidelines into queries to the VHA Corporate Data Warehouse (CDW), a repository of medical and pharmacy records. Captured risk factors included Osteoporosis Self-assessment Tool (OST) score, sex, age, and/or chronic exposure to high risk medications. Veterans at risk were sent enrollment letters, invited to receive care by the BHT, and on acceptance evaluated by clinical nurse educators via standard protocols. As appropriate, enrolled Veterans received Dual-energy X-ray Absorptiometry (DXA) scans, education on bone healthy lifestyle, additional fracture risk assessment, and triage for treatment if identified as either osteoporosis or high-risk osteopenia. Advanced practice

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providers, then evaluated the Veteran's need for osteoporosis pharmacotherapy, performed laboratory evaluations for secondary causes of bone loss, discussed risks/benefits of pharmacological therapies, and when indicated, initiated pharmacological therapy and monitored therapy at scheduled intervals. For this study, we included Veterans contacted by the Rural BHT between 12/1/2016 and 02/01/2018. A non-experimental cohort design was utilized to compare the proportion of osteoporosis screening and treatment in Veterans choosing to participate and those who did not participate, both before and after the establishment of the BHT.

Results: During the first 15 months of implementation, the Rural BHT contacted 3,582 Veterans, with 1,241 (34.6 percent; 95 percent CI, 33.10 to 36.22) Veterans accepting enrollment and 1,132 (91.2 percent; 95 percent CI, 89.51 to 92.67) enrollees completing a DXA scan. Of those participating Veterans, 318 (25.6 percent; 95 percent CI, 23.27 to 28.13) met criteria for and accepted pharmacological therapy. Veterans choosing to participate in the Rural BHT were significantly more likely to complete a DXA scan (91.2 versus 2.6 percent, P less than 0.0001) and to receive pharmacological therapy (25.6 versus 2.4 percent, P less than 0.0001) than those choosing not to participate.

Conclusion: Enrollment in the Rural BHT significantly increases the likelihood that rural Veterans will receive appropriate screening and treatment for osteoporosis. This model for the delivery of primary prevention services for osteoporosis provides unique processes and procedures without adding workload to the primary care team and could potentially be adapted to provide other preventative services, as well as instituted in other care settings outside the VA. Due to their proven benefit at improving patient outcomes in chronic disease management, Clinical Pharmacists are highly qualified and easily incorporated into this model of care.

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Session-Board # - 1-002

Poster Title: Preparing outpatient pharmacies at an academic center for United States Pharmacopeia (USP) 800

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: The U.S. Pharmacopeial Convention published Chapter 800 in February 2016. It sets standards for handling of hazardous drugs in healthcare settings and will be legally enforceable by December 1, 2019. There has been lots of conversation regarding preparation in the hospital and inpatient areas of Pharmacy, but not much specific to an outpatient pharmacy setting. These standards will be enforceable by the FDA, state pharmacy boards, Joint Commission and CMS. This makes understanding what they entail in an outpatient pharmacy of vital importance.

Methods: An Ambulatory Care Outpatient Pharmacist was chosen as the designated person and assigned as the Institutional Leader for USP 800. An initial Gap Analysis was conducted for 7 Ambulatory Outpatient Care pharmacies associated with the Academic Center to assess awareness and readiness. Based on those results, steps were taken for appropriate department awareness. Initial steps were taken to provide education to the Ambulatory Care Outpatient Pharmacies. USP 800 champions were selected from each respective pharmacy and education was provided on appropriate receiving, storage, and handling of hazardous drugs. Environmental Health Services and Facilities Management was involved to provide consultation and assess for any structural changes necessary in the Pharmacies, specifically to receiving and storage areas within the pharmacies. An assessment of risk template was created and completed based on the NIOSH list of hazardous drugs. Updates to Policies and Procedures is ongoing based on pending changes.

Results: All pharmacy staff was educated through department meetings, in-services, and face-to-face pharmacy huddles about upcoming changes in receiving, storage, and handling of hazardous drugs. Staff was further educated about the importance of assessment of risk forms

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for all hazardous drugs, including different dosage forms of the same drug. Pharmacy managers were educated first to facilitate team buy-in and then primary staff involved in receiving and storage was further educated to ensure understanding. In-services were provided to the entire department with support from Pharmacy Administration to further ensure buy-in from the entire department staff. After department wide in-services were given, each pharmacy was visited by the USP 800 designated person and staff members received one-on-one education with live demonstration. This lessened the anxiety of staff regarding upcoming changes and resulted in more overall buy-in. Sample assessment of risk forms were completed and shared with pharmacy team members to demonstrate all required steps in handling of hazardous drugs and provide a visual.

Conclusion: This method ensures that outpatient pharmacies receive the needed and required education on USP 800 in a timely and efficient manner. Support from Pharmacy Administration and Pharmacy Managers lead to overall more buy-in from Pharmacy staff. More buy-in from staff will lead to increased compliance, decreased anxiety regarding changes, and a heightened awareness of employee safety. The comprehensive one-on-one training to complete tasks according to USP 800 standards lead to a better understanding of how to implement such standards within each respective pharmacy and ensure compliance with new pharmacy policies and procedures.

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Session-Board # - 1-003

Poster Title: Evaluation of patients referred to a clinical pharmacy specialist for diabetes management

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Within the Veterans Health Administration (VHA), Patient Aligned Care Teams (PACT) include Clinical Pharmacy Specialists (CPS) who have prescriptive authority and manage diabetic patients referred by Primary Care Providers (PCP). VHA also has performance measures to help assess the quality of diabetes care such as completion of annual foot exams, annual/biennial eye exams, and annual A1c. This project compared the diabetic patients' characteristics and outcomes between those managed by PCP and those referred to a CPS. The primary objective was to describe the referred diabetes population. The secondary objective was to assess A1c outcomes achieved by CPS compared to PCP.

Methods: This is an institutional review board approved, retrospective chart review, quality-improvement project. Patients were screened to include those who had PCP visit(s) for diabetes between October 1 - October 31, 2015. The index date was set as the first visit date. The study period was 18 months post index date. From the screened cohort, patients were excluded if they have been referred to a CPS within 18 months prior to the index date; patients were also excluded if they had a diagnosis of pre-diabetes, co-managed by the endocrinologist(s) for diabetes, received diabetes care outside of the institution, or expired during the study period. Patients who met inclusion and exclusion criteria were categorized into two cohorts: 1) patients managed by their PCP solely and 2) patients managed by CPS via referrals evidenced by referral consults. Data collected included baseline A1c [grouped into less than 9, 9 – 9.9, and greater than 10 groups], diabetes-related complications [neuropathy, nephropathy, retinopathy], and

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diabetes medication regimens [diet only, oral medications, on insulin]. Outcome measures were the percentage of patients that completed an annual A1c check during the study period and A1c change between baseline and end of study period. T-Test or Chi-Square tests were used as appropriate.

Results: Of 972 patients screened, 546 patients were included in the study with 434 patients in PCP group and 112 patients in CPS group. At baseline, the CPS group had less percentage of patients with A1c less than 9 and more percentage of patients with A1c greater than 9, all comparisons were statistically significant (49 versus 95, 21 versus 3, and 30 versus 2 percent) for the A1c less than 9, between 9 – 9.9, and greater than 10, respectively. Other statistically significant baseline characteristics were greater presence of patients with 2 or more diabetes complications, diagnosis of cardiovascular disease, and insulin users in the CPS compared to PCP group (15.2 versus 6.5, 26.3 versus 27.7, and 13 versus 47 percent, respectively). CPS were more likely to have completed an annual A1c (92 percent compared to 81 percent, P equals 0.005). Both the CPS and PCP achieved statistically significant reductions in A1c averaging a 1.2 percent reduction in those with baseline A1c 9-9.9, and an average 3.2 percent reduction in A1c in those with baseline A1c greater than 10. However, mean A1c reductions achieved by CPS compared to PCP were not statistically significant.

Conclusion: Of the patients with elevated A1c greater than 9, a vast majority were referred to a CPS for diabetes management. Those referred appeared to be more complicated by having more patients with baseline diabetes complications, diagnosis of cardiovascular disease, and/or on insulin. Patients managed by CPS were more likely to meet the performance measure of completing an annual A1c. Finally, it appeared that at 18 month follow up, patients referred to CPS achieved a similar mean A1c reduction compared to PCP.

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Session-Board # - 1-004

Poster Title: Evaluating potential predictors of bleeding events in patients taking direct oral anticoagulants

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Oral anticoagulation, either in the form of vitamin k antagonists or direct oral anticoagulants (DOAC), is the recommended therapy for stroke prevention in atrial fibrillation and treatment of venous thromboembolism. The major safety concern while receiving oral anticoagulation is hemorrhage. Bleeding risk schemas exist but are validated in warfarin only. This study aims to determine risk factors associated with bleeding events while taking DOACs.

Methods: This pilot, retrospective case-control analysis was conducted at a single VA health care system. Patients with an active outpatient order for apixaban, rivaroxaban, or dabigatran for at least 90 days with a medication possession ratio of at least 80 percent, plus documented bleeding event comprised the case cohort. A bleeding event was defined as either an admission or discharge associated with any diagnosis code for bleeding. Patients were excluded if receiving edoxaban, receiving dabigatran 75mg twice daily, or if a bleed occurred within 72 hours after a procedure. Control patients were randomly selected in a 1:4 case-control ratio from remaining identified DOAC recipients. The chosen variables for evaluation were: age 65 or older, age 75 or older, history of prior bleed, anemia, thrombocytopenia, diabetes mellitus, uncontrolled hypertension, history of stroke, tobacco use, alcohol abuse, malignancy, kidney dysfunction, liver disease, gastrointestinal disorder, concomitant non-steroidal anti-inflammatory drug (NSAID) use, concomitant NSAID with proton pump inhibitor use, and concomitant antiplatelet use. Univariate analysis and logistic regression were used to identify potential predictors significantly associated with bleeding event occurrence. This study was

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approved by the institutional review board at the Department of Veterans Affairs Saint Louis Health Care System and was exempt from informed consent.

Results: A total of 68 bleeds were discovered, however only 50 patients with bleeding events met inclusion criteria. Of the remaining 1,094 patients, 200 were randomly chosen to make up the control cohort. Overall, the bleed rate was 5.9 percent. Baseline demographic information was evaluated across the type of DOAC the patient received. In general, there were not significant differences amongst the various DOACs, however significant differences were found between groups in patients age 65 or greater, age 75 or greater, DOAC indication, duration on DOAC, DOAC dosed according to the package insert, and kidney dysfunction. Univariate analysis identified the following as significant possible predictors: history of prior bleed, liver disease, anemia, and history of stroke. Age 65 or greater, per protocol, and the listed variables were entered into the regression. History of prior bleed (Odds ratio 2.91, 95 percent confidence interval (1.42-5.98); $p=0.004$), liver disease (Odds ratio 2.97, 95 percent confidence interval (1.05-8.35); $p=0.039$), and anemia (Odds ratio 1.99, 95 percent confidence interval (1.02-3.93); $p=0.045$) were identified as independently associated with bleeding events in this population.

Conclusion: This is the first independent trial to analyze the predictive role of various factors on bleeding events in patients receiving a DOAC. History of prior bleed, anemia, and liver disease were associated with a bleeding event in patients receiving a DOAC. The results of this analysis may aid in identification of factors associated with higher bleeding rates in patients receiving DOACs.

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Session-Board # - 1-005

Poster Title: Medication use evaluation of digoxin utilization at a rural Veterans Affairs healthcare system

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Digoxin should not be used as monotherapy for rate control in atrial fibrillation (AFib), and digoxin should only be used in heart failure with reduced ejection fraction (HFrEF) patients who remain symptomatic after treatment with appropriate guideline directed medical therapy (GDT). Also, digoxin laboratory monitoring should occur at least annually in patients receiving digoxin therapy. Retrospective clinical trials have provided evidence of increased mortality with digoxin use. The primary objective of this MUE was to evaluate prescribing practices of digoxin in veterans with AFib and/or congestive heart failure (CHF). A secondary objective was to evaluate appropriateness of digoxin monitoring.

Methods: This MUE was approved by the Pharmacy and Therapeutics (P&T) Committee prior to implementation. A patient list was generated from Microsoft SQL on October 23, 2017 that included all veterans in the healthcare system with a digoxin prescription issued between October 23, 2016 and October 22, 2017. Patients were distributed for retrospective chart reviews to pharmacists within the healthcare system. Patient charts were accessed through the Computerized Patient Record System (CPRS). Veterans were excluded upon chart review if determined to not be taking digoxin. The following data were collected: age, sex, heart failure diagnosis, AFib/atrial flutter diagnosis, digoxin prescription information, concomitant heart failure medications, concomitant AFib medications, and lab monitoring information.

Results: The MUE included a review of 98 veterans. Eight veterans were excluded due to inactive digoxin therapy. The majority of veterans (75.5 percent) were receiving digoxin for management of AFib. Digoxin was found to be prescribed as monotherapy for AFib rate control

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in 7 patients (7.7 percent). A total of 29 patients (32.2 percent) had HFrEF. Appropriate GDT was missing in 12 patients (41.4 percent) of patients with HFrEF. Only 2 patients (0.22 percent) had a diagnosis of heart failure with preserved ejection fraction without a diagnosis of AFib. Digoxin use was deemed appropriate based on clinical judgement of pharmacists performing chart reviews in 73 patients (75.5 percent). The majority of veterans had a serum creatinine (Scr), potassium (K), and magnesium (Mg) drawn within the past year. However, only 37 patients (41.1 percent) had a digoxin trough drawn in the past year. Digoxin monitoring was deemed appropriate (based on at least annual monitoring of Scr, K, MG, and digoxin trough) in only 25 patients (27.8 percent).

Conclusion: Patients with HFrEF may benefit from the addition of an angiotensin-converting enzyme (ACE) inhibitor or an angiotensin II receptor blocker (ARB) in addition to an evidence based beta blocker. Patients with an ejection fraction less than 35 percent should also be considered for aldosterone antagonist therapy. The greatest area for improvement regarding digoxin therapy within this healthcare system involves increasing the monitoring frequency of digoxin troughs to at least annually. Results of this MUE were presented to the P&T committee, and recommendations for optimizing digoxin use and laboratory monitoring were provided to prescribers via notes entered into patient's charts.

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Session-Board # - 1-006

Poster Title: Implementing a Veterans Affairs collaboration with a school of pharmacy for population management

Poster Type: Descriptive Report

Submission Category: Chronic / Managed Care

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Purpose: Veterans Affairs (VA) Northern California Health Care System (NCHCS) utilizes population management dashboards to identify Veterans requiring interventions. Primary Care dashboards facilitate management of chronic conditions such as diabetes and chronic pain. Pharmacy dashboards facilitate laboratory monitoring of specific medications. Schools of Pharmacy need introductory practice experiences that prepare students for advanced practice, however space and availability at medical facilities may limit accessibility. This poster describes the partnership between a VA Primary Care Service and a School of Pharmacy that utilizes remote access to electronic medical records for students to provide population management services for Veterans.

Methods: A collaboration between NCHCS and University of the Pacific (UOP) was established in September of 2015. Pharmacy students, under the direct supervision of VA clinical pharmacists, provide population management services for Veterans within NCHCS. An introductory pharmacy practice experience (IPPE) elective course was piloted in August 2016 and subsequently approved as a required course beginning April 2018 with 60 students. The population health experiences are conducted at the university by students precepted by VA clinical pharmacy specialists. Students are granted remote access privileges to the VA computerized patient record system (CPRS) and use personally owned laptops and VA provided cell phones. Students focus on the VA opioid safety initiative, specifically performing prescription drug monitoring program (PDMP) activities and review of urine drug screen results. Other activities include ordering laboratory tests for medication safety, calling patients with

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upcoming appointments to educate about the importance of pending immunizations, and facilitating annual hemoglobin A1C testing for patients with diabetes mellitus. Students document progress notes in CPRS, and communicate with other health care providers by adding additional signers to the progress note. Students complete a baseline assessment during the first day of the course regarding their experience and competence performing population health activities and again on at the end of the IPPE. Additionally, changes in the clinical dashboard metrics are monitored.

Results: Three process improvement activities were implemented. VA Human Resources (HR) staff travel to UOP to conduct fingerprinting and picture taking, reducing foot traffic into the VA HR office and reducing travel time for students. Because paperwork for student onboarding was excessive for VA staff, two UOP staff became VA without compensation employees and have assumed these responsibilities. The original immunization report identified Veterans who missed immunizations at their prior appointment. The VA clinical applications coordinator developed a report that identifies Veterans with upcoming appointments and an active clinical reminder for immunizations. This enables the students to call veterans prior to the appointment and provide education about the benefits of immunizations. The outcomes of student activities are available in two domains. Over 4,700 Veterans are prescribed chronic opioid therapy within NCHCS. Students complete approximately 300 PDMP progress notes per week. This has enabled over 99% completion of the annual PDMP requirement and an improvement of the quarterly PDMP measure from 39% to 58% between April and June 2018. NCHCS was not meeting immunization goals for Human Papilloma Vaccine (HPV), Hepatitis B Vaccine and Meningococcal Vaccine. Students' efforts resulted in meeting the measure for Hepatitis B and approaching the goal for HPV.

Conclusion: The collaboration between a VA Primary Care Service and a School of Pharmacy utilizing remote access to CPRS meets many objectives. VA's teaching mission is accomplished while addressing the limitations for work space and computers at the medical facility. Students are provided real-world introductory experiences with population management including educating patients, navigating CPRS and documenting progress notes. NCHCS has an additional team to address quality measures and support population health activities.

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Session-Board # - 1-007

Poster Title: Expansion of clinical pharmacy services for the management of hypertensive patients at a Veterans Affairs healthcare system: a quality improvement project

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Hypertension is the most common chronic condition among veterans, affecting more than a third of the veteran population. To adequately treat hypertensive patients, multiple medication dose adjustments, frequent lab monitoring, non-pharmacologic treatment, and consistent follow up are often required. Primary care providers often have limited clinic availability due to annual follow up appointment, inhibiting the ability for intermittent appointments to optimize care. These intermittent appointments are crucial for medication titration and to ensure adequate blood pressure control. The primary objective of this quality improvement project is to improve hypertension control through the expansion of established clinical pharmacy services.

Methods: This quality improvement project was approved by the Pharmacy and Therapeutics Committee and deemed IRB approval was not required. Based on data within the Primary Care Almanac, a performance measure tool, patients were included if they had a diagnosis of hypertension, were above blood pressure goal (systolic blood pressure greater than 140 mmHg or diastolic blood pressure greater than 90 mmHg), had a diagnosis of ischemic heart disease, with or without diabetes, and written consent from the provider and patient. Patients were excluded during initial chart review if they had an acute cause of hypertension (i.e. uncontrolled pain, alcohol withdrawal, acute mental health decompensation), medical emergency, already enrolled in the Pharmacotherapy Clinic, or diagnosed with congestive heart failure. The following data was collected during initial chart review: comorbidities, allergies, vitals, labs, and

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past antihypertensive medications trialed. Upon completion of the intervention window, a final chart review was completed to collect vitals, labs, medication changes, adverse effects, other pharmacy interventions, and medication adherence to analyze the primary and secondary outcomes. The primary outcome was the percentage of patients that met goal blood pressure based on the Department of Veteran Affairs/Department of Defense (VA/DoD) guidelines for hypertension. The secondary outcomes included appropriate medications prescribed following the VA/DoD guidelines, medication adherence, and adverse effects of medications.

Results: Seventeen patient were enrolled into the Pharmacotherapy Clinic to be managed for hypertension. The average age of patient seen in clinic was 71.4 years old. All patient enrolled were males. The average atherosclerotic cardiovascular disease (ASCVD) 10-year risk was 36 percent. At baseline patient most patients were taking aspirin (16), statins (16), beta blockers (11), and angiotensin II receptor blocker (ARBs) (7). Prior to clinic enrollment, the average systolic blood pressure was 150.9 mm Hg and diastolic blood pressure was 81.9 mm Hg. At the completion of the invention window, the average systolic blood pressure was 134.9 mm Hg and diastolic blood pressure was 75.4 mm Hg. Twelve patients were considered at goal upon initial visit when blood pressure was checked manually in clinic by the pharmacist. Ultimately, 82.4 percent of patients met blood pressure at goal and 17.6 percent did not meet blood pressure goal at the completion of clinic. Three medications were initiated in clinic, one medication was titrated up and one medication was tapered off. Eleven patients reported being adherent to their medications and six patients required pharmacist intervention. Adverse drug reactions included two with lisinopril, one with hydrochlorothiazide and one to beta blockers.

Conclusion: Pharmacist intervention led to accurate assessment and documentation of patient's blood pressures and improved blood pressure control. Continued education is needed to ensure proper blood pressure checks are being performed in clinic by healthcare professionals as the majority of patients were meeting goal when pressures were checked according to recommended procedures. Additionally, proper documentation is essential to allow timely and accurate assessment of the patient and to ensure the facility is meeting national metrics. Further expansion of this project may allow for improved outcomes in the larger population at this facility

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Session-Board # - 1-008

Poster Title: Medication use evaluation of bisphosphonate therapy within a Veteran Affairs healthcare system

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Literature supports bisphosphonates use for the prevention of fractures in postmenopausal women with osteoporosis and men with osteoporosis. Specifically, patients that are diagnosed with osteoporosis receive the most benefit. Long-term utilization of bisphosphonate therapy has been associated with increased risk of side effects without additional benefit. Studies have found that utilization of bisphosphonate therapy for an extended duration does not lead to a statistically significant increase in clinical vertebral fractures, non-vertebral fractures, or clinical fractures.

Therefore, this MUE was conducted to assess the appropriateness of active bisphosphonate therapy and recommendations to providers were made to deprescribe bisphosphonate therapy as appropriate.

Methods: This medication use evaluation was approved by Pharmacy and Therapeutics Committee. A patient list was generated from Microsoft SQL on 3/14/2018 that included all veterans in a rural VA healthcare system with an active bisphosphonate prescription issued between 3/14/2017 and 3/14/2018. Education was provided to pharmacists regarding appropriate use of bisphosphonate therapy. Patients were then distributed for retrospective chart reviews to pharmacists within this facility. Patient charts were accessed through the Computerized Patient Record System (CPRS). Veterans were excluded upon chart review if determined not to be taking a bisphosphonate. The following data were collected: age; sex; race; height; weight; prescriptions characteristics; calcium and vitamin D supplementation; bone mineral density; indication for use and documentation on cover sheet; labs including kidney function, liver function, calcium, vitamin D and TSH; history of fractures and side effects.

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Recommendations for continuation or discontinuation of bisphosphonate therapy, calcium and vitamin D supplementation and future monitoring was provided to prescribers via notes entered into patient charts.

Results: A majority of patients were receiving bisphosphonates for primary osteoporosis. Only 34.3 percent of patients have an indication for bisphosphonate therapy listed as an active problem. Bone mineral density data was available for review in 80 percent of patients receiving bisphosphonate therapy, however a follow up bone mineral density was recommended to be ordered at next follow up in 62.9 percent of patients. A majority of patient receiving bisphosphonate therapy are also receiving vitamin D supplementation (62.9 percent), however lacked calcium supplementation (65.7 percent). Additionally, pharmacists recommended initiating calcium supplementation in 62.9 percent of patients and initiating vitamin D supplementation in 37.1 percent of patients. One patient was not started on calcium supplementation due to history of kidney stones. Bisphosphonate therapy was deemed appropriate in 65.7 percent of patients at the start of therapy, 68.6 percent of patients currently on treatment and to continue in 60 percent of patients. Therefore the recommendation to stop bisphosphonate therapy was made in 31.4 percent of patients.

Conclusion: Continued assessment of active bisphosphonate therapy upon renewal is warranted. Encourage providers and pharmacists to assess bisphosphonate therapy upon renewal of bisphosphonate therapy to ensure the need for continued use. Utilization of clinical reminders to prompt providers to order updated bone mineral density scans could increase monitoring data and allow for monitoring of bisphosphonate therapy. Discourage the use of bisphosphonate therapy in patients that are inappropriate including those with osteopenia, poor renal function and low risk of fracture.

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Session-Board # - 1-009

Poster Title: Estimation of cardiovascular disease (CVD) events by use of QRISK a atherosclerosis cardiovascular disease (ASCVD) risk assessments tools in Indian patient.

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Cardiovascular diseases (CVD) are currently one of the major causes of disability and mortality in both economically well-developed as well as developing countries. The past years have witnessed major strides in the prevention of CVDs through modification of its causes. The most dramatic advance has been the demonstration that aggressive medical therapy will substantially reduce the likelihood of recurrent major coronary syndromes in patients with established CVD. The purpose of this study is to predict the incidence of CVD event by evaluating risk factors using QRISK and ASCVD risk assessment tools.

Methods: Prospective observational study conducted in intensive care unit (ICU), medical wards, surgical wards, and high intensive care unit (HICU) of tertiary-care hospital in India for 6 months. The required data was collected in form case sheets, treatment chart, lab master, the physical examination of the medication with patient is also verified. A questionnaire was used to gather information from patients. The age, sex, social status, laboratory data, weight, height, Blood Pressure (BP), family history and therapeutic management were recorded. The data was introduced to QRISK and ASCVD risk score calculators and the risk for development of CVD in each patient was determined and risk score was observed for each risk factor in the study sample. QRISK and ASCVD risk assessment tools, are among a number of scoring systems used to determine an individual's chances of developing cardiovascular disease by giving an estimate of the probability that a person will develop cardiovascular disease within a specified amount of time, usually 10 years. Results have altogether, 257 cases analyzed. QRISK and ASCVD risk scores were used to classify individuals according to Low, Moderate and High risk factor for developing CVD in the next few years of the individual's life.

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Results: As per QRISK and ASCVD scales, the percentage was respectively 31 percent (n equals 80) as Low risk, 32 percent (n equals 82) as Moderate risk, 37 percent (n equals 95) as High risk for ASCVD and 24 percent (n equals 62) as Low risk, 28 percent (n equals 72) as Moderate risk, 48 percent (n equals 123) as High risk for QRISK. Risk scores were compared for each risk factors using QRISK and ASCVD risk tool assessments. When compared according to their Blood Pressure, out of 44 patients with Stage 2 BP had high risk. 40 percent (n equals 18) of the individual had High risk score for developing CVD events. Obese individuals were 13 percent (n equals 33) among sample and all of them had high risk according to QRISK and ASCVD. Smokers had higher risk according to QRISK than Non-Smokers with 40 percent (n equals 29) high risk score. Non-Diabetic patients were having lower risk according to ASCVD and QRISK than Diabetics with 67 percent (n equals 23) out of 46 of Non-Diabetic having low risk according to ASCVD and 50 percent (n equals 17) according to QRISK.

Conclusion: Risk of developing CVD event was predicted clinically QRISK and ASCVD risk assessment tools, which are among a number of scoring systems used to determine an individual's chances of developing cardiovascular disease by giving an estimate of the probability that a person will develop CVD within a specified amount of time, usually 10 years. Risk factor assessment tools can be conveniently used to assess general CVD risk and risk of individual CVD events (coronary, cerebrovascular, peripheral arterial disease and heart failure). The estimated absolute CVD event rates can be used to quantify risk and to guide preventive care.

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Session-Board # - 1-010

Poster Title: Assessment of the risk factors for cardiovascular events by framingham risk score and metabolic syndrome risk tool

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Heart attacks, stroke, and other preventable cardiovascular diseases (CVD) kill or seriously affect half of the population. The majority of the heart attacks and strokes that occur every year are caused by one or more cardiovascular risk factors like hypertension, diabetes, smoking, high levels of blood lipids, physical inactivity and most of these CVD events are preventable if meaningful action is taken against these risk factors. The study is intended to assess the role of Risk Scores in indication of Metabolic Syndrome (MetS) and understanding the chances of increased risks for future cardiovascular disease events using Framingham Risk Score (FRS).

Methods: Prospective observational study conducted in medicine wards of tertiary-care hospital, India for six months. The newly admitted case charts diagnosed with hypertension, diabetes and geriatric patients. The required data was collected in form case sheets, treatment chart, lab master, the physical examination of the medication with patient is also verified. A prepared questionnaire to gather information of patient data collection was used to collect all the details like inpatient number, age, sex, social status, laboratory data, weight, height, Blood Pressure (BP), family history and therapeutic management. Then the data was introduced to FRS and MetS risk score calculators. FRS is designed to predict the risk of heart problems (including mortality) caused by coronary heart disease and non-fatal myocardial infarction for 10 years to come in the life of the individual, taking into account the presence or absence of risk factors score that was observed for each risk factor in the study sample. MetS is a modern day epidemic which predicts CVD mortality; the incidence and progression of carotid atherosclerosis and sudden death independent of other cardiovascular risks.

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Results: After analysing 260 cases, they were compared with risk factors and risk score in patients using FRS classifying them according to their risk score. The percentage was 57 percent (n equals 147) as Low risk, 6 percent (n equals 15) as Moderate risk, 37 percent (n equals 95). MetS was Present in 65 percent (n equals 167) of the sample. Studying the risk for developing CVD event according to their Blood Pressure, out of 44 patients with Stage 2 BP, 50 percent (n equals 22) of the individuals had high risk score for developing CVD events. Obese individuals were 13 percent (n equals 33) among sample and all of them had high risk according to FRS. Non-Diabetic patients were having lower risk according to FRS than Diabetics with 70 percent (n equals 32) out of 46 Non-Diabetic individuals in the sample having low risk and 61 percent (n equals 129) out of 210 Diabetics having high risk. Studying the effect of Lipid profile, results showed the significance of the role of HDL in preventing cardiovascular events, 78 percent (n equals 18) out of 23 individuals with HDL levels lower than 35mg/dL showed higher risk.

Conclusion: Framingham risk equations could stratify lifetime risk for CVD by the estimation of 10-year absolute risk of developing CVD. Despite its high prevalence, little is known of the prospective association of the MetS with cardiovascular and overall mortality. Early identification of the metabolic abnormalities and taking appropriate intervention would help in fighting the growing epidemic of disease. This research focused on the role of Risk Factors in predicting stage of the CVD and combine the results in order to come up with Therapeutic Regimen that can suit the majority of CVD patients based on a clinical trial.

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Session-Board # - 1-011

Poster Title: Optimizing transitions in care through implementing bedside medication delivery and counseling prior to hospital discharge

Poster Type: Descriptive Report

Submission Category: Clinical Services Management

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Purpose: Encouraging patient compliance and proper medication use during transitions of care has become a national focus to help minimize adverse health outcomes and reduce medical costs. In 2016 the University of Chicago Medicine Pharmacy Department implemented a Meds2Beds program to help assist with the medication component of the transitions in care process. The program delivers discharge prescriptions to patient's bedside along with providing medication education by the pharmacist. The purpose of this descriptive, retrospective study is to determine the impact of implementing bedside medication delivery and pharmacist counseling on transitions of care.

Methods: This program operates as a separate entity in the hospital's outpatient pharmacy. A team of three clinical pharmacists work with Advanced Medication Access Coordinators and pharmacy students to coordinate discharge prescription processing and delivery. The clinical pharmacists perform a clinical review of each patient's medication therapy enrolled in the program by using an electronic health record (EHR) system. Student pharmacists also join in doing an extensive assessment of the patient's medical history. Students are given an opportunity to demonstrate their knowledge and collectively decide with the pharmacist what counseling points are most important to discuss given the chosen medication regimen. Nurses, physicians, case managers, and social workers are encouraged to enroll patients into the program except those going to long-term care facilities, hospice centers or transplant patients. Once the patient is successfully enrolled in the program and the patient's charts have been reviewed by both clinical pharmacists and student pharmacists, the prescriptions are then filled and delivered to bedside. If a patient is uninsured, a coordinator is able to provide medications for little to no cost using the hospital's 340B plan.

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After data from the program is collected and analyzed, a 15-minute meeting is held biweekly with the pharmacy manager and team to address issues or challenges and suggest solutions within the program. This concept of quality improvement (QI) adopts the Plan-Do-Study-Act cycle.

Results: Over the course of the program, enrollment has increased to roughly 200 to 400 patients being serviced a week. The increase in patient demand and discharges during the weekend has led the program to extend hours of operation from Monday through Friday to Monday through Saturday. Overall, the positive feedback from healthcare providers located in the hospital and patients being discharged has shown the program to be useful during transitions of care. Although there has not been any data to support an improvement in health outcomes such as a lower readmission rate, increased refills, or less adverse drug events there has been a significant increase in the outpatient pharmacy's total revenue. As the program continues to grow data will be collected to show if there is an impact being made on health outcomes.

Conclusion: Many patients face barriers that can prevent them from filling their prescriptions after discharge, such as treatment cost, lack of transportation, and/or having a negative past experience with a medication. Implementation of bedside medication delivery and counseling prior to discharge resulted in lower medication costs for patient's, an increase in patient satisfaction and an increase in total revenue for the outpatient pharmacy.

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Session-Board # - 1-012

Poster Title: Targeting best chronic obstructive lung disease (COPD) documentation practices: a pharmacy-collaborative quality improvement project at a Veterans health care system

Poster Type: Descriptive Report

Submission Category: Clinical Services Management

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Purpose: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) consensus guidelines is the gold standard for best practices in COPD assessment and management. Currently, the study institution does not use standardized tools for assessment and documentation of COPD, such as validated symptom assessment questionnaires like the COPD Assessment Test (CAT). The goal of this pharmacy-collaborative quality improvement project was to develop, select, and implement standardized assessment and documentation tools that integrate the most updated GOLD guideline recommendations for use by providers in a Veterans pulmonary clinic and to assess the use and impact of these tools on clinical practice.

Methods: This quality improvement project involved collaboration between the pharmacy and pulmonary services. It consisted of three phases: Phase I: pre-tool assessment of COPD clinical practices in a Veterans pulmonary clinic, Phase II: development of tools, and Phase III: post-tool assessment of COPD clinical practices in the pulmonary clinic. During Phase I, a retrospective chart review of selected clinic patients was conducted by Pharmacy Service to evaluate current COPD assessment and documentation practices pre-tool implementation. Documentation of specific GOLD-recommended assessment practices was collected, particularly use of CAT, evaluation of exacerbations, spirometry, and tobacco use. During Phase II, assessment and documentation tools were developed and selected based upon results of a chart review, input from clinic providers, and integration of the 2017 GOLD guideline recommendations. These tools consisted of a patient intake questionnaire and an electronic note template. During Phase III, the Pharmacy Service educated the clinic providers on use of the assessment and documentation tools. Following dissemination of the tools, usage of the tools by the clinic

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providers and patients and documentation of GOLD-recommended assessment practices pre- and post-tool implementation were collected, evaluated, and compared by the Pharmacy Service as part of a seven-week pilot assessment.

Results: A total of 14 pulmonary clinic providers received training. A total of 66 patient intake questionnaires were distributed to COPD patients, in which 51 (77 percent) were returned. Prior to implementation of the clinic patient intake questionnaire and COPD electronic note template (Phase I), a sampling of 14 clinic notes were reviewed. None of the notes (0 percent) included use of CAT score while 10 notes (77 percent) addressed exacerbations, 12 notes (92 percent) contained documentation of spirometry, and 13 (100 percent) notes included assessment on tobacco use. After implementation of Phase III, a sampling of 20 clinic notes were collected and reviewed. Eight (40 percent) notes included a CAT score while 16 (80 percent) notes included assessment of exacerbations, and 20 (100 percent) notes included spirometry results and assessment of tobacco use.

Conclusion: This pharmacist collaborative quality improvement project lead to increased documentation of specific GOLD-recommended clinical assessment measures at a Veterans pulmonary clinic. Further collaborative educational efforts between the pulmonary and pharmacy services will be conducted to enhance usage of documentation tools and assess their impact on clinical practice and COPD management.

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Session-Board # - 1-013

Poster Title: Increasing access to care for rural veterans by leveraging clinical pharmacist providers

Poster Type: Descriptive Report

Submission Category: Clinical Services Management

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Purpose: Launched in October 2016, the Clinical Pharmacy Specialist (CPS) Rural Veteran Access (CRVA) Initiative employed a multi-dimensional approach to increase access to support rural veteran healthcare needs. Pharmacy Benefits Management Service (PBM) partnered with the Office of Rural Health (ORH) and was awarded \$136 million over 5 years to expand the use of CPS in advanced practice provider roles. Funding was provided for the placement of 180 CPS positions at 63 VA facilities and their rural outpatient clinics. The CPS positions are focused on improving access in 3 areas of identified need: primary care, pain management, and mental health.

Methods: The PBM Clinical Pharmacy Practice Office (CPPO) developed an infrastructure designed to ensure CRVA initiative success that included forming a steering committee to standardize and operationalize implementation of this enterprise-wide initiative (EWI). Comprehensive database systems were established to measure facility CPS hiring status and track the workload, metrics, and interventions of every pharmacist involved with the program. A consultative visit process to promote practice sharing and project successes was deployed and during these visits the team focuses on pharmacist professional practice, CPS practice redesign, and optimization of clinical pharmacy services. A comprehensive CPS Mentorship Program was developed that matches new clinicians with established seasoned practitioners (mentors) to accelerate and standardize project practice implementation across all sites. Finally, CPPO developed and presented Clinical Pharmacy Leadership Boot Camps through a series of

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virtual teleconferences from September to October 2017 and Clinical Pharmacy Boot Camps which were face-to-face programs. The Leadership Boot Camp series focused on the implementation, promotion, and maintenance of expanded Clinical Pharmacy programs through a succession of topic specific presentations to facility Clinical Pharmacy Champions. The Clinical Pharmacy Boot Camps provided clinical training for the CPS hired as part of the program through the development of two curriculums, one for primary care CPS and one for pain and mental health CPS.

Results: This EWI has demonstrated significant increases in access to care. During the period from October 1, 2017 thru May 30, 2018, CPS providers have performed 268,734 patient care encounters for 102,159 veterans of which 69% were considered rural. In the primary care practice area, CPS performed 125,371 encounters for 41,101 veterans. In mental health there have been 41,041 encounters for 16,436 veterans and in pain management there have been 31,307 encounters for 13,571 veterans. In addition, the CRVA CPS have documented disease state interventions totaling 300,243 in primary care, 96,943 in mental health and 74,212 in pain management. CPPO conducted 21 consultative visits in FY18 with more anticipated during FY19. The mentoring program has paired 54 mentor/mentee matches and is expanding into a group mentoring program. The five Clinical Pharmacy Boot Camp programs trained 186 CPS in clinical practice topics determined to have the largest knowledge gaps for participants based on a gap analysis assessment. A post-training analysis showed the percentage of participants who rated their knowledge as “No/Minimal” decreased by 83% and the percentage of participants who rated their knowledge as “Mastery” increased by 334%.

Conclusion: The implementation of this CPS rural health program has significantly improved access to care for over 100,000 veterans in the initial year of the program. This is care that would have not have been delivered without these advance practice pharmacists. In addition to the improved patient access, the project has been instrumental in improving the training of both the CPS as well as Clinical Pharmacy Champions at the 63 facilities involved and has helped develop lasting infrastructure and cultural change which will help support future clinical pharmacy practice initiatives.

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Session-Board # - 1-014

Poster Title: Evaluation of interdialytic catheter lock protocol conversion in a dialysis unit

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Catheter locking solutions, namely heparin, sodium citrate, and tissue plasminogen activator (tPA), are used to minimize catheter-related thrombosis and bacteremia in hemodialysis (HD) patients using chronic central venous catheters (CVC). Studies show no significant difference between heparin and sodium citrate in catheter-related complications. A significant reduction in complications was seen in heparin versus tPA, however, with a significant cost increase. The primary objective was to evaluate the incidence of catheter-related thrombosis and bacteremia after protocol conversion from tPA three times per week to heparin twice weekly and tPA weekly. The secondary objective was to determine cost avoidance after protocol conversion.

Methods: This is an institutional review board approved, quality assessment study. The study period is from November 1, 2015 to October 31, 2017. The index date is the date of implementation of the change to the individual patients, and closest to November 1, 2016. All patients 18 years or greater undergoing chronic hemodialysis using a CVC at least one month before (period 1) and after (period 2) the proposed change was included. Patients were excluded if undergoing acute dialysis, receiving dialysis during a hospital admission, but receives chronic dialysis at an outside facility, or using an arteriovenous fistula or arteriovenous graft for HD. Thrombosis was defined as tPA protocol violation (greater than 4mg of tPA catheter lock solution used per HD session during period 1 and greater than 4mg of tPA catheter lock solution used per week during period 2) or catheter exchanges due to clot as documented by renal attending. The primary objective measures were the number of incidences of catheter malfunction due to thrombosis as defined in the study, and the number of incidences of catheter-related bacteremia. Secondary objective included calculation of cost

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savings before and after the protocol conversion. Descriptive statistics and paired t-test were applied as appropriate.

Results: Among the 314 patients receiving HD during the study period, 19 patients met the inclusion and exclusion criteria. When compared between period 1 and period 2, there was no difference in primary outcomes of number of tPA protocol violations (20 versus 18, p-value equals 0.94), number of catheter exchanges due to clot (1 versus 0, p-value equals 0.33), and number of catheter-related bacteremia (3 versus 2, p-value equals 0.58). Of the 19 patients, 8 versus 7 patients had a tPA protocol violation, 1 versus 0 patients had a catheter exchange due to clot, and 3 versus 1 patients had a catheter-related bacteremia between period 1 and period 2, respectively. For the secondary outcome, the realized cost savings for the study population was approximately \$223,000 and the estimated cost savings after the protocol conversion for the study period reached \$370,000.

Conclusion: The findings suggest the protocol conversion did not affect the number of catheter thrombosis or catheter-related bacteremia in patients undergoing chronic HD using a central venous catheter. In addition, replacing tPA with heparin was more cost-effective, generating significant cost-savings.

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Session-Board # - 1-015

Poster Title: Switching to infliximab-dyyb results in no differences in clinical outcomes among patients with inflammatory bowel disease (IBD)

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Inflectra (infliximab-dyyb), an anti-tumor necrosis factor-alpha (anti-TNF-alpha), is a recently approved biosimilar to the biologic agent Remicade (infliximab). Both agents received FDA indication for moderate to severe irritable bowel disease (IBD). Of note, biosimilars are not considered interchangeable with biologics. To our knowledge, in the United States, there currently is no publication evaluating the interchangeability between infliximab biologic (Remicade) to infliximab-dyyb biosimilar (Inflectra). The primary objective of this study is to investigate the safety and efficacy of switching from Remicade to Inflectra. We also aim to calculate the potential cost savings when switching from biologics to its comparable biosimilar.

Methods: This is an institutional review board approved, retrospective chart review study. Patients with IBD cared for by the Veterans Affairs Long Beach Healthcare System gastroenterology clinic were converted from Remicade to Inflectra. Patients who did not receive continuous care by the aforementioned clinic, were newly initiated on Inflectra, or did not receive Remicade for at least 90 days prior to the conversion were excluded. Endpoints were evaluated at 6 months or longer after conversion. Safety endpoints were infusion reactions, steroid utilization, and hospital admissions related to IBD. Efficacy and clinically relevant endpoints were clinical remission (determined by GI attending), endoscopic remission (defined as Simple Endoscopic Score-Crohn's Disease score 0 to 2; Mayo endoscopic score 0, 1), and biochemical remission (defined as stable or improving C-Reactive Protein results). As conversion dose was set at milligram to milligram, we also examined the need for dose escalation at 6-month evaluation. A subgroup analysis was conducted to examine safety and

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efficacy outcome differences between patients who were on concomitant immunosuppressive therapy versus those who were not. Finally, we calculated the cost-minimization associated with the conversion by estimating the yearly projected drug costs using the drug prices set for the Veterans Health Administration by its prime vendor. Descriptive analysis was conducted, t-test was performed for sub-analysis.

Results: Among the 61 patients identified with IBD, on long-term infliximab infusion, and followed by GI clinic, 17 met criteria and were included in analysis. Baseline characteristics revealed the average age was 47.6 years (standard deviation 14.3); 82.4 percent (14 patients) had Remicade as their first anti-TNF alpha therapy; 47.1 percent (8 patients) were on concomitant immunosuppressive therapy - either 6-mercaptopurine or methotrexate. At 6 months after conversion, 13 patients (76.5 percent) were in clinical remission; 15 patients (88.2 percent) achieved biochemical remission; and 12 patients (70.6 percent) were in endoscopic remission. Our data also showed 4 patients experienced infusion reactions; no patients required a new course of steroid therapy or increase in existing steroid doses; and there was no hospitalization. The sub-group analysis found only those who were not on concomitant therapy experienced infusion reactions (4 out of 9 patients without concomitant therapy). Overall, the yearly calculated cost savings was \$68,629 for the study cohort.

Conclusion: We used multiple parameters to evaluate the safety and efficacy of Inflectra use in patients who switched from Remicade therapy for chronic IBD. Our findings suggest this conversion is safe and effective. Over 70 percent of patients achieved multiple desired outcomes. Infusion reactions only occurred in those who were not on concomitant immunosuppressive therapy. Furthermore, no converted patient experienced an increase in steroid utilization or hospitalization. Finally, the conversion yielded nearly \$70,000 in yearly cost savings. Future studies with longer follow-up intervals and larger cohorts is warranted to further support the use of biosimilar therapies.

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Session-Board # - 1-016

Poster Title: Clinical considerations of sodium-glucose co-transporter 2 inhibitor use in a community setting

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Sodium-glucose co-transporter-2 (SGLT2) inhibitors have been demonstrated to significantly reduce hemoglobin A1C and provide cardiovascular benefit in patients with diabetes. Additionally, they exhibit other favorable properties including weight loss and lowering blood pressure. Although clinical trials have shown that these medications are generally well-tolerated with low discontinuation rates, their side effect profile raises concern for potential failures in medication persistence in clinical practice. The purpose of this study is to evaluate efficacy, safety, and medication persistence of SGLT2 inhibitors at our military treatment facility.

Methods: Computerized outpatient prescription records were searched to identify SGLT2 inhibitor prescriptions dispensed between the dates of July 1, 2014 to July 31, 2017. The data was cross referenced to prescriber clinic location and medication therapy start date. Patients were excluded from this retrospective chart review if they were prescribed SGLT2 inhibitors prior to the start of the study period and if the prescription was written by a provider outside of the military treatment facility. A retrospective chart review of 119 patients was performed. Demographic data, baseline and follow-up data were collected to include: hemoglobin A1C, blood pressure, weight, concurrent anti-hyperglycemic medications, and documented side effects. This study received clearance for submission by the Public Affairs Officer/QI Review Board.

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Results: A total of 119 patient charts were reviewed retrospectively. The baseline age ranged from 30 to 78 years with the median age of 58. Of the included patients, 82 patients were male, over 95 patients had diagnosis of hypertension and/or hyperlipidemia. The most commonly prescribed SGLT2 inhibitor was empagliflozin. More than half of the patients were prescribed these medications by a clinical pharmacist (69 patients) followed by endocrinologists (24 patients). This review showed hemoglobin A1C reduction of greater than 0.2 percent in 85 patients, greater than 5 mmHg reduction in systolic blood pressure in 60 patients, and weight loss of greater than 1kg in 82 patients. Medication persistence evaluation revealed that 71 patients continued with SGLT2 inhibitors as part of their medication therapy for diabetes; however, 48 patients discontinued use during the study period due to side effects, non-adherence, and lost to follow-up. Of the thirty-six patients that reported side effects including genitourinary infection and polyuria only 11 of them discontinued therapy due to intolerance.

Conclusion: The use of SGLT-2 inhibitors in the treatment of diabetes is on the rise due to the growing evidence of cardiovascular benefit in patients with diabetes. This retrospective chart review confirms the positive benefit of the SGLT2 inhibitors in lowering hemoglobin A1c, blood pressure and weight. Concern for medication persistence in clinical practice was also confirmed but was not solely attributed to side effects.

DISCLAIMER

The views expressed in this abstract are those of the Authors and do not reflect the official policy of Department of the Army, Department of Defense, or the U.S. Government.

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Session-Board # - 1-017

Poster Title: Analysis of prescriptions that are not recommended for use together

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: In accordance with the Drug utilization review program developed by Korea Ministry of Food and Drug Safety(MFDS) in 2004, a single tertiary general hospital has been conducting prescription control through a computer program for drugs prohibited to be used in combination since 2006. However, in order to treat certain patients, it is inevitable to use the drugs together. Yet, follow-up studies are lacking. Therefore, this study was conducted for the purpose of guiding safe drug use by analyzing the status of prescription including incidence of personal injury and monitoring performance rate which was selectively allowed.

Methods: This study was conducted for patients who received medications that are not recommended to use together during the hospitalization period from August 1, 2016 to July 31, 2017 in a single tertiary general hospital in Korea. The cases were not administered together and the emergency situations such as cardiopulmonary resuscitation were excluded. In order to analyze the prescription status, we collected data on the combination of medicines, reasons to avoid combined prescription, number of days together, and reasons for requesting cancellation of control. For safety evaluation, data on monitoring performance, interaction rate, and number of days of hospital stay were collected. The data were retrospectively collected using medical records and analyzed using IBM SPSS Statistics ver. 23.0(IBM Co., Armonk, NY, USA).

Results: Among the prohibited drug combinations announced by the MFDS, there were 17 kinds of combinations prescribed in the hospital for the past one year and the total number of cases was 306. Of the total prescriptions, the actual follow-up monitoring rate was 110 cases (35.9%) and the incidence of adverse events was 42 cases (13.7%). However, 176 cases (57.5%)

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were not identified because monitoring was not performed. In addition, the prescription rate for children under 18 years old and geriatrics aged 65 years or older who required careful use of medications due to relatively high risk of adverse drug reactions were 117 cases (38.2%) and 37 cases (12.1%) respectively, accounting for 50.3%. The combination of drugs that are not recommended to use together announced by MFDS is highly likely to cause harm to patients. Although follow-up monitoring should be accompanied, a low monitoring rate was observed in this study. Therefore, additional measures are needed, such as follow-up check by the pharmacist, to increase it. In particular, it is necessary to concentrate on children and the elderly.

Conclusion: Drugs that are not recommended to use together are highly risky and should be considered in conjunction with the patient's clinical situation, taking risks and benefits into consideration. In addition, patients should be monitored continuously for the prescriptions. In particular, it is necessary to focus on children and the elderly who are relatively vulnerable to adverse drug reactions. This study has significance in analyzing not only prescription status but also post-management status such as monitoring performance rate and symptom incidence. This will serve as the basis for safer drug use. Further multi center studies are needed for more comprehensive studies.

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Session-Board # - 1-018

Poster Title: Effect of face-to-face and website-based counseling methods in acne vulgaris knowledge improvement and retention among university students in Bekaa governorate, Lebanon, 2018

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Acne vulgaris is a common skin disorder of adolescents that has major physical and psychological impact. Proper counseling is needed to alleviate acne vulgaris signs and to provide appropriate education. The objectives of this study were to compare the effect of two different counseling methods, face-to-face counseling versus website-based counseling, on the improvement in knowledge about acne vulgaris among university students; to detect knowledge retention one month after the counseling; and to evaluate satisfaction of participants with the two counseling methods.

Methods: An interventional study was conducted on first and second year university students in a private university in Bekaa governorate, Lebanon, in 2018. Students, from different majors, with acne vulgaris, were selected. Two clinical pharmacists conducted the study, using a set of questionnaires and tests, including a questionnaire for demographic data, followed by a pre-test composed of multiple-choice questions to detect baseline knowledge about acne vulgaris. After the pre-test, participants were randomly assigned to receive counseling about acne vulgaris by one of two methods: face-to-face counseling by the clinical pharmacists, aided by a handout, or website-based counseling using an in-house website about acne vulgaris specially developed for the study. Both counseling methods offered the same information about acne vulgaris pathophysiology, risk factors, medications, and education. Immediately following the counseling by either of the two methods, a post-test was administered to assess knowledge improvement. Moreover, a participant satisfaction questionnaire was used to evaluate each of

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the two methods. One month later, the post-test was repeated to determine knowledge retention. Pre- and post-tests were corrected and graded out of 24. Descriptive and univariate analyses for independent and paired groups were performed using SPSS version 17.

Results: One-hundred-and-twelve students were recruited for the study, 85% were females, with a mean age of 20.0 ± 1.5 years. Eighty percent felt that they learn better using face-to-face learning methods, with reading and listening together, compared to computer-based methods. No association was found between type of counseling and baseline characteristics. Pre- and post-test scores showed improvement (P -value <0.05) in both groups in all questions. The website-based counseling method scores had a mean rise from 9.7 ± 4.0 to 16.1 ± 4.0 , and face-to-face counseling method from 9.8 ± 4.0 to 15.3 ± 4.2 in the pre- and post-tests respectively. There was no significant difference between the two counseling methods. The retention of knowledge after one month was observed in both website-based counseling method with a mean score of 14.0 ± 6.0 and face-to-face counseling method with a mean score of 15.0 ± 5.0 . As a whole, 70% of participants were satisfied with the counseling sessions. Seventy-seven percent considered that the study helped them understand acne. However, participants in the face-to face group were more satisfied with the counseling session compared to the website group.

Conclusion: The face-to-face and the website-based counseling methods were both effective and comparable in improving knowledge about acne vulgaris among university students, despite face-to-face counseling method being considered more enjoyable by participants. Both methods may be used by pharmacists to successfully deliver information about acne vulgaris. The website-based method offers a promising opportunity for counseling, and is as effective as traditional methods. Given the wide use of the Internet and technology among such population, the website-based counseling can support pharmacist counseling to provide and allow retention of knowledge about common disorders like acne vulgaris.

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Session-Board # - 1-019

Poster Title: Prognostic factors and the impact of infectious disease consultations on the management of candidemia: a tertiary hospital experience in Japan

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Candidemia is an important nosocomial infection due to its high mortality and morbidity. Detailed investigations on the prognostic factors of candidemia based on each institution's practical data are essential for better management. In our hospital, infectious disease (ID) consultations by an antifungal stewardship (AFS) team were implemented from October 2015. Few studies have been conducted on the impact of ID consultations on the management of candidemia. The objectives of the present study were to identify prognostic factors and evaluate the impact of ID consultations on the management of candidemia.

Methods: A total of 121 patients diagnosed with candidemia in our hospital between January 2007 and December 2016 were enrolled in the present study. Our AFS team consists of physicians and infectious disease-specialized pharmacists. Prospective audits and feedback based on the results of blood culture tests were performed. Among patients with candidemia, we provided the following items to physicians as a bundle: 1; initiation of an adequate dosage of antifungal therapy based on the Infectious Disease Society of America (IDSA) published candidiasis guidelines, 2; removal of a central venous catheter (CVC), 3; follow-up blood cultures to confirm the clearance of *Candida* species, 4; ophthalmological consultations to rule out endophthalmitis, 5; an adequate duration of therapy. The dosage of antifungal agents and duration of therapy were evaluated using the IDSA candidiasis guidelines. Fifteen patients who received these bundles were defined as the ID consultation group. The 30-day mortality rate was examined by Kaplan-Meier plots and the Log-rank test. A multivariate Cox hazard analysis was performed to identify factors associated with death. P values less than 0.05 were

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considered to be significant. The study protocol was approved by the ethics committee in our institution.

Results: The 30-day mortality rate was 33%. Systemic antifungal agents were administered to 114 patients. The median number of days from blood cultures to the initiation of antifungal therapy was 2 (range of 0-9 days). The proportion of each antifungal agent was as follows: fluconazole 28.9%, micafungin 51.2%, liposomal amphotericin B 6.6%, voriconazole 2.5%, itraconazole 2.5%, and caspofungin 2.5%.

Between patients with and without ID consultations, significant differences were observed in the appropriate dosage of antifungal therapy (ID consultations 86.6% vs. without ID consultations 44.4%), follow-up blood cultures to confirm the clearance of *Candida* species (ID consultations 100% vs. without ID consultations 56.5%), ophthalmological consultations (ID consultations 80% vs. without ID consultations 41.4%), and an appropriate duration of therapy (ID consultations 60% vs. without ID consultations 15.1%). No significant differences were observed in the 30-day mortality rate (ID consultations 20% vs. without ID consultations 30.3%) according to the Log-rank test (P value of 0.38). *Candida albicans*, the absence of antifungal therapy, an advanced age, lung diseases, and mechanical ventilation were identified as significant factors for a high mortality rate, whereas *C. parapsilosis*, the removal of CVC, and surgical wards were associated with a lower mortality rate.

Conclusion: Approximately 50% of patients received micafungin as an initial antifungal therapy. Our ID consultations using bundles contributed to the better management of therapy; however, no significant differences were observed in mortality rates. In terms of practical procedures, the prompt administration of antifungal therapy and removal of CVC were essential for favorable outcomes among patients with candidemia.

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Session-Board # - 1-020

Poster Title: Pharmacy-implemented hepatitis C virus (HCV) point of care (POC) test protocol to increase antibody testing in veteran birth cohort population

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Patients born between 1945 to 1965 are considered a high risk population for HCV and Veterans are at a 25 percent higher chance of having contracted the disease as compared to the general population. HCV antibody testing is not routinely done through patients' primary care providers. Our HCV staff used multiple campaigns to increase Veteran testing including provider education, patient education through letters and phone calls urging them to get tested, and community education by speaking at various Veteran-sponsored events. To further improve test rates, a POC antibody test protocol was implemented for pharmacists and clinical technicians to increase testing among rural, homeless and patients without transportation.

Methods: Pharmacist from HCV clinic worked in collaboration with ancillary testing coordinator from laboratory service to establish POC testing protocol for HCV. A policy was established that defined when the tests could be used such as at health fairs, stand down events, and homeless outreach visits. Patient's electronic chart was checked before testing was conducted to prevent duplicate testing. Specimens collected are capillary fingerstick whole blood taken by using a lancet device. The POC kits purchased include single use test device, developer solution, reusable test stands, and specimen collection loops. Internal quality control built in to the device was used for every patient. Pharmacy staff were trained and certified to use the POC kits online and hands-on use. Laboratory conducted validation verification using specificity and sensitivity tests with statistic agreement of 95 percent confidence level prior to field use. Pharmacy staff was given access to entering results into patient's electronic chart. Once the POC test was conducted results were ready in 20 to 40 minutes and recorded on approved patient log. If a patient had a negative result, no further action was needed other than to notify

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the patient. If a positive antibody resulted, then follow-up HCV RNA viral load was needed to confirm active infection.

Results: In fiscal year 2018, there are 1899 patients needing to be tested out of the total 12,798 in the birth cohort. There have been four events attended thus far in which a total of 41 patients have been tested. This represents two percent of the population needing to be tested. Of the patients tested, zero have been positive.

Conclusion: HCV POC protocol allowed an increase in testing among patients who are unable to come to the laboratory, increased convenience for patients who live far from the laboratory facilities, increased awareness and education for patients whose contact have been limited due to no address or phone number listed, and increased testing, education and awareness among all Veterans regardless if they were in the birth cohort. Because limited staff was used to initiate the POC testing, the quantity of patients reached was not as many as we would have liked. There are still many more patients in the birth cohort that need to be tested who do not attend these staffed outreach events. Although invitation letters about local area events were sent to patients in advance, only a few of the patients who received the letters would show up. POC testing could be improved if staff could attend more outreach events regularly and continue to do outreach among the homeless population. In 2017, HCV homeless outreach was done twice weekly, but in 2018, outreach was stopped due to changes in staffing priorities. There are additional outreach events planned through Fiscal Year 2018. Overall, the program has been a success with an increase in the number of patients being tested, for whom without testing would not have been done at all.

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Session-Board # - 1-021

Poster Title: Effect of successful hepatitis C treatment on glycemic control and complications of type 2 diabetes mellitus in United States veterans

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: The primary objective of this study was to determine the impact of successful treatment of Hepatitis C with antiviral pharmacotherapy on the change in hemoglobin A1c (HbA1c) in patients with type 2 diabetes mellitus (T2DM). In addition, this study investigated the impact of therapy on microvascular complications (retinopathy, nephropathy, and neuropathy) and macrovascular complications (stroke, myocardial infarction, and death) of type 2 diabetes mellitus in the veteran population with Hepatitis C.

Methods: A retrospective cohort analysis was conducted through electronic chart review in patients with chronic Hepatitis C and T2DM. The local Hepatitis C clinical case registry was used to identify patients treated from January 1, 2005 to June 30, 2016 in the pharmacy liver clinic. Patients were included in the study if they completed antiviral Hepatitis C treatment at the Providence Veterans Affairs Medical Center and had a diagnosis of type 2 diabetes mellitus. Patients were excluded from the study if they did not complete antiviral therapy, were lost to follow-up, or died before sustained virologic response could be assessed, or were enrolled in hospice or palliative services at time of enrollment. Patients were characterized based upon achievement of sustained virologic response. The primary outcome was the change in mean HbA1c, which was analyzed for the 24-month period pre-treatment and post-treatment using a paired t-test. We estimated that a sample size of 90 patients would provide 80% power to detect a 0.37% difference in HbA1c pre- and post- treatment assuming a standard deviation of 1.2% and an alpha level of 0.05. As a secondary analysis, patients were followed from the index date to either death or the end of the study period and assessed for the incidence or progression of microvascular complications (retinopathy, nephropathy, neuropathy), and macrovascular complications (stroke, myocardial infarction, death).

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Results: A total of 72 patients met inclusion and exclusion criteria and were evaluated in the study. For all patients, the average pre-treatment HbA1c was $7.29\% \pm 1.12$ and the average post-treatment HbA1c was $6.91\% \pm 0.99$; $-0.39\% \pm 1.23\%$ [95% CI -0.67 to -0.11], p-value < 0.01. The change in mean HbA1c was greater in patients who achieved a sustained virologic response as opposed to those who did not achieve viral suppression. In the group of patients who did not achieve SVR, the HbA1c actually rose on average by nearly 0.5%. However, this group of patients is too small (n = 6) to draw any meaningful conclusions. Patients with a higher baseline HbA1c of greater than or equal to 7.0% showed a greater reduction in mean HbA1c over the study period of nearly 1.0%. Patients enrolled in metabolic clinic, endocrinology clinic, or diabetes care team had a greater reduction in mean HbA1c. Macrovascular complications were numerically higher in the group of patients who did not achieve a sustained virologic response.

Conclusion: Treatment of Hepatitis C with antiviral therapy was associated with a minor but statistically significant reduction in HbA1c from the 24-month period pre-treatment to the 24-month period post-treatment. The reduction in HbA1c was greater among patients with a baseline HbA1c greater than or equal to 7.0%. Sustained virologic response was associated with a greater reduction in HbA1c, although the size of the population limits interpretation of this data. Enrollment in metabolic clinic, diabetes care team, or endocrinology clinic represents a potential confounding variable.

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Session-Board # - 1-022

Poster Title: Quarterly training days: management strategy to engage staff in burnout and depersonalization reduction

Poster Type: Descriptive Report

Submission Category: Leadership Development

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Purpose: Organizational satisfaction and employee engagement is a high priority for Veterans Affairs (VA) to help build a collaborative, inclusive and results-oriented culture. The VA utilizes an “All Employee Survey” (AES) as a tool to assess employee satisfaction and make positive changes in the facility and work group. Each year work groups are encouraged to create an action plan for areas identified in the AES which need improvement. Burnout and depersonalization are two areas in the AES that indicate employee withdrawal. The purpose of this intervention was to improve AES results in burnout and depersonalization by implementing quarterly pharmacy training days.

Methods: Pharmacy supervisors implemented quarterly a “Pharmacy Training Day” to address concerns with burn out and depersonalization from the 2016 AES. The training sessions were split into two blocks which were each three hours in length. Each training session included three to four speakers from different disciplines along with a team building activity. Activities and topics were chosen based on employee suggestions. Training topics included meditation, customer service, choice, food as medicine, battlefield acupuncture, self-care, health at every size, accountability, promotion opportunities, ethics, duress and code procedures, recovery care, active listening, and a lab tour. In addition, supervisors organized lunch (chili and cookie cook-off) and treats for the staff (ice cream sundaes, espresso bar, smoothies) as well as massages as part of the training day. Pharmacy staff was split into two groups to ensure adequate coverage of essential functions in pharmacy, and Clinical Pharmacy Specialists cancelled clinic during training time. Team building activities included walking and history tour

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of campus, building a snowman and Easter egg hunt. Pharmacy staff was encouraged to complete an evaluation form at the end of each session.

Results: The first pharmacy training day started in June 2017 with a total of four training days completed to date. Training day evaluations overwhelming felt the pharmacy training days were worthwhile. Ninety-nine percent of employees agreed/strongly agreed the training was a positive learning experience and the content of the training was appropriate. Ninety-six percent of the pharmacy staff agreed/strongly agreed the training met their expectation. Each year the employees are encouraged to take the AES which asks a variety of questions about the workplace and workplace climate on a scale of zero to five. After two pharmacy training days, depersonalization decreased from fiscal year (FY) 2016 to FY2017, 3.29 to 2.32 respectively on the AES. In addition, burnout decreased from 2.57 in FY 2016 to 2.12 in FY2017. A lower number is more favorable in both of these areas. Workgroup satisfaction and organization satisfaction remained the same between FY 2016 to FY2017. Employee feedback is positive, including “great line up – I really learned a lot from this training”, “loved the activity getting outside”, and “I really enjoy training day and look forward to them. Gives us a good break from our everyday routine. Thank you for doing these.”

Conclusion: Pharmacy training days decreased burnout and depersonalization in the pharmacy workgroup within five months after receiving the 2016 AES results. Utilizing quarterly pharmacy training day is a novel approach to effectively addressing concerns identified in the AES while providing a break from the everyday pharmacy routine. In the future, pharmacy supervisors will obtain continuing education for the training sessions as well as include topics that address other items in the All Employee Survey.

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Session-Board # - 1-023

Poster Title: Therapeutic adherence study to oral oncological medications

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Compliance of oral cytostatic drugs of oncological patients at the ambulatory level is important for the success of the treatment. The continuity of the treatment contributes to achieve remission of the disease and avoid relapses. The main objective of the study was to evaluate the adherence to treatment with oral cytostatic drugs in cancer patients. The secondary objective was to analyze the variables that can influence in adherence related to the patient's characteristics, treatment and disease.

Methods: Prospective observational study. Adult patients who start treatment with oral cytostatic drugs in Pharmacy Service were included (March-May 2017). Study was approved by the ethic committee and informed consent was obtained for all subjects.

Data collected: related to patient (sex, date of birth, living alone vs not, toxic habits, profession), disease (diagnosis, stage, date of diagnosis, treatment line, Eastern Cooperative Oncology Group (ECOG), concomitant diseases, mental disease) and treatment (drugs, tablets per day, frequency, fasting or food intake, alternative therapy, adverse effects (AE), medication administers: patient, supervised administration or by caregiver).

Main variable: % compliance. Measurement of adherence methods: 1)Registration of dispensations, 2)Morisky-Green Test, 3)Self-assessment by the patient of their own adherence (visual analog scale of 1-10, from worst to best compliance). Patients were considered adherent if during the entire study period: 1)Measurement of adherence 100%, 2)Morisky-Green Test high adherence and 3)Self-assessment by the patient 10.

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Statistics: Sample size determination (80% compliance similar to the published, $p < 0.05$, accuracy $\pm 10\%$). Quantitative variables: mean $\pm$ standard deviation. Qualitative variables: absolute value and percentage (95% confidence interval). Comparison of means: Student's T test or Mann-Whitney test (according to normal Kolmogorov-Smirnov test). Association of qualitative variables: Chi square test or Fischer exact test. To determine the association of different variables associated with lack of adherence, logistic regression models were used ($p < 0.05$). SPSS software 19.0.

Results: 74 patients. 41/74 men. 63.2 $\pm$ 11.5 years old. 14.9% lived alone. 10.8% smoking patients. 41.9% active work. Diagnostic: colon/rectal cancer $n=46$ (62.2%), central nervous system cancers $n=7$ (9.5%), kidney cancer $n=7$ (9.5%), breast cancer $n=4$ (5.4%), lung cancer $n=3$ (4.0%) and others $n=7$ (9.4%) (ovarian cancer, melanoma, gastrointestinal stromal tumors and thyroid carcinoma, prostate cancer, neuroendocrine tumor, soft tissue sarcoma). Stage II/III 45.9%, IV 54.1%. Treatment line: adjuvant/neoadjuvant therapy 47.3%, first-line treatment of metastatic 35.1%, others metastatic lines 17.6%. 33 patients ECOG=0, 37 patients ECOG=1, 4 patients ECOG=2-3. 41.9% without concomitant diseases, 32.4% 1-2 diseases, 25.7% 3 or more. 14/74 mental health patients. Treatment: Capecitabine $n=49$, temozolomide $n=7$, sunitinib $n=6$, pazopanib=2, osimertinib $n=2$, $n=1$: imatinib, enzalutamide, everolimus, olaparib, dabrafenib, afatinib, axitinib and sorafenib. 48.6% (36/74) concomitant intravenous antineoplastic. 60.9% patients: 1-6 tablets/day, 39.1% patients: 7-16 tablets/day. Frequency of administration: 28.4% once a day, 71.6% twice daily. Food: 71.6%; fasting 14.9%; indifferent 13.5%. 5.4% alternative therapy. 37.8% no AE; 48.6%: 1-2 AE; 13.5%: ≥ 3 AE. 9.5% medication administered by caregiver/supervised.

Adherence results: 74.3% patients (55/74) 100%adherent. Sex: 85.4% men vs 60.6% women ($p=0.015$). Medication administers: 77.6% patient vs 42.9% others ($p=0.045$). No statistical significance was found in the other variables evaluated.

Conclusion: The percentage of adherent patients was similar to that published in the bibliography. Sex and who administers the medication influence compliance with treatment. The pharmacist must be actively involved in the detection of non-adherent patients and contribute to an improvement of therapeutic compliance through education of the patient and his family.

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Session-Board # - 1-024

Poster Title: Customized health information technology effectively directs care delivery in Veterans undergoing orthopedic surgery

Poster Type: Descriptive Report

Submission Category: Pain Management / Palliative Care

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Purpose: Chronic post-surgical pain (CPSP) affects up to 58 percent of patients following orthopedic surgery. The risk is especially high in Veterans due to the prevalence of concurrent mental health diagnoses. Developing CPSP can lead to prolonged opioid therapy. To track post-operative clinical progress, opioid usage and CPSP risk factors, the Veterans Administration (VA) Salt Lake City Healthcare System Transitional Pain Service (TPS) developed the Follow-Up Report (FUR), a health information technology (HIT). The FUR calculates and chronologically sorts follow-up dates for pre-specified intervals to prioritize care delivery. We investigated the proportion of Veterans completing follow-up at each interval.

Methods: We performed a retrospective cohort study to evaluate the role of the FUR on care coordination after discharge from surgery. We identified all Veterans discharged from an orthopedic surgical procedure at the VA Salt Lake City Healthcare System between 01/17/2018 and 06/01/2018, and included those that were assigned to receive peri-operative and follow-up care from TPS. The data source for this investigation is the VA Corporate Data Warehouse, a repository of medical and pharmacy records. The primary outcome was the proportion of Veterans with a completed follow-up visit, defined by entry of both a TPS progress note and pain scores in the electronic medical record, at each of the pre-specified intervals as shown on the FUR. The secondary outcome was the proportion of Veterans with a completed follow-up visit at each interval, based on surgical procedure. Confidence interval (CI) estimates were calculated using the Clopper-Pearson exact test for both the primary and secondary outcome.

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Results: The investigation cohort is comprised of 96 Veterans, accounting for 100 orthopedic surgical procedures: 12 ankle, 14 hip, 38 knee, 29 shoulder and 7 other orthopedic procedures. For the primary outcome, we observed the following proportions for completed follow-up; day-2: 82 percent (95 percent CI: 73 to 89); day-7: 82 percent (95 percent CI: 73 to 89); day-10: 74 percent (95 percent CI: 64 to 82); day-14: 79 percent (95 percent CI: 69 to 86); day-21: 69 percent (95 percent CI: 58 to 78); day-30: 78 percent (95 percent CI: 67 to 86); day-60: 75 percent (95 percent CI: 64 to 85); day-90: 69 percent (95 percent CI: 54 to 81); day-120: 75 percent (95 percent CI: 53 to 90). In the secondary outcome, we observed variations in completion rates at each interval, based on surgical procedure. However, the overlap of confidence intervals did not highlight any specific surgical procedure(s) as outliers for completed follow-up.

Conclusion: A customizable HIT has allowed TPS to efficiently and effectively track clinical progress, opioid use and pain scores for Veterans undergoing orthopedic surgery. We report a high proportion of Veterans with completed follow-up at each evaluation interval. The synergy between HIT and dedicated population-health programs holds immense potential for optimizing care delivery. Our model of TPS and the FUR can be replicated to direct care delivery in other service lines within VA, and beyond.

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Session-Board # - 1-025

Poster Title: Therapeutic drug monitoring of ustekinumab in psoriasis patients with good response.

Poster Type: Evaluative Study

Submission Category: Pharmacokinetics

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Purpose: In recent years, studies about therapeutic drug monitoring for biopharmaceuticals have been carried out in rheumatoid arthritis, inflammatory bowel disease and psoriasis. These studies shown a relationship between clinical response and serum concentrations. However, the studies on clinical relevance of therapeutic drug monitoring for ustekinumab in patients with psoriasis are particularly scarce. Our objective is to analyze the trough concentrations of ustekinumab in patients with moderate to severe plaque psoriasis with good response.

Methods: Observational retrospective study of all psoriatic patients treated with ustekinumab and monitored in the Pharmacy Service was carried out from September 2017 - February 2018. All patients should present a Psoriasis Area Severity Index (PASI) less than 3 maintained for at least 6 months (good responders). The ethics committee approved this study. The informed consent was obtained for all subjects before entry in the study. Patients received ustekinumab 45 mg every 12 weeks if weight <100 kg, and 90 mg every 12 weeks if weight > 100 kg after dosage regimen induction. Patients should have been treated with ustekinumab for at least 1 year. The serum levels of ustekinumab were assessed immediately prior to the administration of the drug (Ctrough), after pharmacist interview. The concentrations of ustekinumab were quantified by capture ELISA immunoassay (Triturus® analyzer).

Data collected: sex, age, weight, date diagnosis psoriasis, diagnosis psoriatic arthritis (PA), previous treatment with biologist drugs, duration of ustekinumab treatment, dosage (mg and mg/Kg), concomitant treatment (immunosuppressive drugs, topical corticosteroid and/or oral,

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retinoids) PASI scale before start of ustekinumab treatment (PASlu) and at blood extraction time (PASle), ustekinumab concentration.

Statistics: descriptive analysis of variables (SPSS version 19.0); quantitative variables (median/range) and qualitative (percentage).

Results: 29 patients (62.1% men). Age: 51 (35-79) years old. Weight 80 (51-117) Kg, 6 patients > 100 Kg. Time since diagnosis 23 (4-58) years. 10.3% PA. 72.4% previously treated with anti-tumor necrosis factor (anti-TNF) drugs (19/20 etanercept, 8/20 adalimumab, 4/20 infliximab). Treatment time: 67.3 (6.0-108) months. Dosage: 23 patients 45 mg, 6 patients 90 mg; 1.6 (1.0-2.0) mg/Kg. Concomitant treatment: 1-acitretin, 1-methotrexate. PASI values: PASlu 10.7 (4.7-26.6); PASle 0.0 (0.0-3.0), 24/29 patients PASle 0.0. Ustekinumab concentration 0.75 (0.22 - 5.0) mcg/ml; Comparison ustekinumab concentration dose 45 mg vs 90 mg: 0.75 (0.22 - 5) mcg/ml vs 0.90 (0.24 - 2.8) mcg/ml ($p > 0.05$). The concentrations of ustekinumab obtained in our patients were higher than published in summary of product characteristics at steady state: dose 45 mg median 0.75 vs 0.21-0.26 mcg/ml; 90 mg dose, median 0.90 vs 0.47-0.49 mcg/ml. A negative correlation was found between ustekinumab concentrations and the dose/weight ratio (mg/kg), but no statistical significance was found (correlation coefficient -0.32, $p > 0.05$).

Conclusion: Drug concentration was detected in all patients. No relationship was found between ustekinumab concentration and dosage administered. However, there seems to exist a negative correlation between them. Further researches are needed to determine the clinical significance between ustekinumab concentration and clinical response, and hence the usefulness of therapeutic drug monitoring in psoriasis patients treated with ustekinumab.

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Session-Board # - 1-026

Poster Title: Introductory overview session and its effect on student performance

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

Primary Author: Jason Guy; University of Findlay;

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Purpose: Student engagement has been at the forefront of pharmacy education recently due to evidence that suggests it helps increase student performance and knowledge. Literature has further shown that engagement and interaction specifically with instructors can help increase student performance. The purpose of this research was to identify if a course overview session with the lead instructor at the beginning of the semester could be useful for student education and lead to enhanced performance in the pharmacy curriculum. If successful this process could be beneficial to try to implement in other courses or on APPEs.

Methods: An optional individual course overview session was offered to students at the beginning of the semester in the Introduction to Pharmacy Practice II course. Students enrolled in the course had the option to email the lead instructor to setup a time to meet to discuss the objectives of the course, timeline for the course, and assessment criteria/expectations. This provided students with time to ask questions they had regarding the course and also provided an opportunity to get to know the instructor at the beginning of the semester. Final course grades of individuals who chose to participate in the session (n equals 50) were compared to individuals who did not participate in the session (n equals 60) to determine if participating in the session and engaging with the faculty member via a one-on-one session enhanced performance in the course.

Students were sent a survey at the midpoint of the semester via Survey Monkey to provide qualitative feedback on the session. The survey used a 5-point Likert scale for all 5 questions. An alpha of 0.05 and a power of 80 percent were used in the study. A t-test was utilized and a p-value of less than 0.05 represented statistical significance. To reduce the risk of selection bias ranges of final course scores were calculated and compared between groups. The University IRB approved this study.

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Results: Students who chose to participate in the course overview session had a mean final course score of 87.7 percent, while students who did not participate in the course overview session had a mean final score of 85.2 percent (p equals 0.02). There were 22 students who completed the survey out of 50 eligible. Student feedback was overwhelmingly positive. One hundred percent of student respondents agreed or strongly agreed on the following topics: that the course overview session was beneficial, that the session improved their engagement in the course, that they would recommend the session be used in other courses, that the session helped motivate them to succeed, and that the session helped establish rapport with the instructor. The course overview session took on average 17 minutes to complete per student. Student final course scores ranged from C minus to A in both groups.

Conclusion: The course overview session was highly effective in the Introduction to Pharmacy Practice II course. The course overview session significantly enhanced student performance and increased student reported engagement in the course. These same principles could be applied to other areas of the curriculum including APPE rotations to potentially increase student performance as well as student engagement and rapport with preceptors.

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Session-Board # - 1-027

Poster Title: Doxazosin for the treatment of nightmares and night sweats in a veteran population

Poster Type: Descriptive Report

Submission Category: Psychiatry / Neurology

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Purpose: Noradrenergic activity, such as nightmares and night sweats, commonly affect individuals with past trauma related events. Many veterans report these symptoms which are also associated with a reduced quality and length of sleep. Prazosin has previously been studied to reduce excessive noradrenergic brain activity. The purpose of this retrospective chart review is to evaluate the use of doxazosin in a veteran population. Doxazosin, an inhibitor of postsynaptic alpha-1 adrenergic receptors in both the brain and peripheral nervous system, is hypothesized to be a potentially effective and tolerable treatment alternative to prazosin.

Methods: This retrospective chart review included veterans prescribed doxazosin at our facility. Inclusion criteria consisted of (1) reported symptoms of nightmares or night sweats, (2) started on doxazosin from September 1, 2015 to January 31, 2017, and (3) at least one follow-up appointment with the initiating provider. Exclusion criteria consisted of (1) doxazosin prescribed solely for prostate, bladder, or hypertension, (2) concomitant non-uroselective alpha-antagonists, (3) documented allergy or anaphylaxis to doxazosin, (4) report of not taking doxazosin or did not fill the prescription, and (5) did to follow up with the provider after the first prescription. The primary endpoints of this retrospective chart review were percent differences in nightmares and night sweats. The secondary endpoints were percent increase in average sleep length per night, average optimal dose of doxazosin, and incidence of adverse effects. Chart reviews were conducted beginning with the date of initial doxazosin prescription until end of therapy, or until the last visit prior to July 31, 2017 when data collection ended.

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Results: During the review period, 225 charts were screened, and 132 of those charts met the inclusion criteria. Nightmares were present for 94 veterans. With doxazosin therapy, the average reduction in nightmares was 38 percent (1.1 less nights per week). Night sweats were initially reported for 64 veterans. With doxazosin, night sweats were reduced by an average of 27 percent (0.9 less nights per week). For the secondary outcomes, average sleep length per night increased by 0.2 hours (range: 0 to 5 hours per night), the average dose of doxazosin was 5.3 mg (range: 0.5 to 20 mg/day), and adverse effects occurred in 55 percent of individuals. The most common adverse effects reported with doxazosin within this review were lightheadedness (23 percent), drowsiness (21 percent), and dizziness (16 percent). No veterans experienced serious adverse effects.

Conclusion: Doxazosin appears to be effective for reducing nightmares and night sweats in this veteran population, regardless of mental health diagnosis, co-occurring sleep disorders, or substance use. Additional studies may further elucidate its utility within the Veterans Affairs Health Care System as well as in other populations.

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Session-Board # - 1-028

Poster Title: Implementation of clinical pharmacy services in the management of alcohol use disorder at a rural Veterans Affairs healthcare system: a quality improvement project

Poster Type: Evaluative Study

Submission Category: Psychiatry / Neurology

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Purpose: Alcohol use disorder (AUD) is a common disease among veterans that often goes untreated. Pharmacists are in a unique role to offer first line pharmacotherapy to veterans for management of AUD. This quality improvement project evaluated the impact of clinical pharmacist directed treatment of AUD. The primary objective was to measure effect on alcohol consumption frequency and quantity in veterans enrolled in the AUD clinic. A secondary objective examined patient access to AUD pharmacotherapy by comparing the number of patients who recalled being offered an AUD medication prior to clinic versus those that did not.

Methods: This project was approved by the Pharmacy and Therapeutics (P&T) Committee prior to implementation and did not require IRB approval. The VA Academic Detailing Service (ADS) Alcohol Use Disorder Data Resource was used to identify patients with AUD who were not receiving drug therapy for treatment of AUD and had an Alcohol Use Disorder Identification Test (AUDIT-C) score of 4-9 recorded in 2017. Patients were excluded from entry into clinic if they had an active prescription for AUD pharmacotherapy, AUD in remission, primary care or mental health provider outside the VA, an AUDIT-C score of greater than 9 or less than or equal to 3, hospitalization in the 6 months prior to clinic implementation for an unstable medical condition, recent or current substance use disorder programming, or a co-occurring substance use disorder (other than nicotine or cannabis). A pharmacist sent consults to primary care or mental health providers for enrollment. Once enrolled, alcohol consumption frequency and quantity was tracked using the Quick Drinking Screen (QDS) to evaluate days drinking per week, drinks per week, drinks/drinking day, and days per week drinking greater than or equal to 5

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drinks per day. Patients were seen in clinic following the Addiction-Focused Medical Management format, and education was provided regarding pharmacotherapy. Data collection stopped after 4 months of clinic time and was analyzed using descriptive and inferential statistics.

Results: A total of 50 patients met criteria for entry into clinic. Thirty-one patients were not enrolled in clinic as consultation was declined (25 patients declined and 6 providers declined). A total of 19 patients were enrolled into the AUD clinic. Of this number, 12 patients were seen once (discharged or lost to follow-up), and 7 patients were seen at least twice in clinic. The baseline average AUDIT-C score of patients seen in clinic was 5.6 representing moderate to high risk drinking. The majority of patients seen in clinic had a comorbid diagnosis of depression, a pain related condition, or nicotine use disorder. During the intervention window, days drinking per week was decreased from 5.42 to 5.19, drinks per week was decreased from 23.32 to 21.62, drinks per drinking day was decreased from 3.84 to 3.64, and days per week binge drinking was decreased from 3.05 to 2.28. Only 1 patient recalled being offered an AUD medication prior to clinic enrollment out of the 19 patients seen at least once in clinic. One patient was managed on follow-up using naltrexone therapy in addition to brief intervention, and 6 patients were managed on follow-up using brief intervention alone.

Conclusion: The pharmacy led AUD clinic decreased alcohol consumption frequency and quantity and increased patient education regarding AUD medications. Multiple areas for ongoing process improvement to optimize patient care were identified. Currently enrolled patients continue to be managed in clinic. Future plans for clinic expansion may include prospective enrollment of patients with positive AUDIT-C screens in primary care or mental health settings.

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Session-Board # - 1-029

Poster Title: Effective methods to detect medication errors in surgical wards by clinical pharmacist at a tertiary care hospital in Bangalore: a single blinded prospective observational study

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Mustafa Ali

Purpose: Medication error is a common vital problem in all healthcare systems around the world. They are associated with life threatening complications, rise in patient treatment cost as well as prolong hospitalisation. The purpose of this study was to determine and compare the effective methods that can detect the medication errors. Two methods were included in this study via direct observation method which was done by directly observing the nurses while administering the medications and medication chart review method was done by collecting and analysing the data and finally reporting it to the concerned clinicians.

Methods: The complete study was primarily focused on the errors that occurs during drug administration and its related errors. Direct observation was used to detect medication errors on each day upon observation, the clinical pharmacist as an observer was present at the nursing unit prior to medication administration. The observer witnessed the administration of 100 doses per day by the nurses. During this process, the nurses were blinded and were not aware of the clinical pharmacist observation. The observed data were then cross checked with the medication chart to confirm the errors. The error was further discussed with the clinicians immediately. In medication chart review process, the charts with the same hospital reference number as that observed using direct observation method were being studied. The case sheet, medication profile, lab master, hospital formulary, drug storage and labelling, databases and hospital protocol files were thoroughly investigated to identify for any associated errors in the case. Then, the observer analysed the collected data and finally reported the errors for the

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concerned clinicians. All the errors were further classified and the effectiveness of the method was demonstrated based on the nature, type and number of the errors reported by respective method. This study included all patients admitted to the surgical ward both adult and geriatric patients irrespective of the diagnosis.

Results: A total doses of 12572 in 558 patients were observed over a period of six months. In the study, the male patients (77 percent) were higher compared to female patients. The direct observation method covered a total of 5820 (46.2 percent) doses and the medication chart review method involved 6752 (53.7percent) doses. Out of 12572 doses, the administration error was documented in 383 (3 percent) doses, in which direct observation method share was 290 errors (75.7 percent) and the medication chart review method accounted for 93 errors (24.2 percent). The type of errors observed by both the methods were distinguish. Out of 2713 errors, 1323 errors (48.7 percent) were detected by direct observation method and 1390 errors (51.2 percent) by medication chart review method. Subsequently, the direct observation method detected 22.7 percent of errors compared to 20.5 percent errors by medication chart review. Direct observation method showed effective in observing unauthorised drug (drug not prescribed) storage at patient bedside (29.7 percent) followed by drug duplication (18.2 percent). Whereas the medication chart review demonstrated its effectiveness in identifying use of inappropriate abbreviation (21percent) as well as drug drug interactions (19.6 percent).

Conclusion: Two detection methods to observe medication errors (observation and medication chart review) proved to be efficient and reliable . The direct observation method was able to capture higher number of medication errors primarily related to administration errors compared to the medication chart review. The medication chart review method was able to capture the superficial information related to medication error. Over all, the direct observation method was more effective method to detect medication errors.

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Session-Board # - 1-030

Poster Title: Prospective study on off-label use of anesthetics and analgesic in a tertiary care hospital-clinical pharmacist intervention

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: The purpose of this study was to find out the loose links between off-label use Food and Drug Administration (FDA) medication prescribing and utilization of anesthetic and analgesic medications also to identify adverse drug reaction associated between off-label anesthetics and analgesic with other therapy drug as off-label use of medicines creates uncertainty around liability and physicians may be less likely to report adverse events experienced by the patient or to receive inferior therapy.

Methods: The study was conducted in all wards at a tertiary care hospital in India. The newly admitted adult patient was randomly selected on daily basis and reviewed for the off-label usage. The patient demographics and all medically relevant information was noted in a predefined data collection form. The Micromedex, Medscape and references books were used as tools to review the prescription and case charts. All patients receiving off-label medication who were taking at least two drugs and had hospital stay of at least 48 hours considered as inclusive criteria. 1262 prescription reviewed in which 200 of them had off-label use. The study involved 200 patients, of which 92 patients recruited were male and 108 were female patients. Adverse drug interactions occurred due to drug-drug interaction was recorded in an adverse drug reaction reporting form. For each adverse drug reaction, the following information were recorded: type of adverse event, seriousness, onset and resolution, severity, causality, action taken, and event outcome, and was analyzed using the following methods: causality assessment by WHO (world health organization) and Naranjo scales and severity by Hartwig scale. The data were stored confidentially and subjected to further analysis using appropriate software.

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Results: During six month 1262 patient prescriptions were scrutinized, in which 200 prescriptions had off-label use. Major patients (n equals 117; 58.5 percentage) received anesthetics followed by analgesics. fentanyl 20 (17 percentage) was highly prescribed anesthetic drug followed by adrenalin 17 (14.5 percentage), pethidine 16 (14 percentage), and atracurium 12 (10 percentage). The off-label indications were lidocaine: management of cancer pain; propofol: chronic migraine; ketamine: bronchospasm, opioid withdrawal; adrenalin: anaphylaxis, bradyarrhythmia, cardiac arrest, hyperkalemia, septic shock, local anesthesia; midazolam: refractory status epilepticus; atracurium: induction of neuromuscular blockade during mechanical ventilation; pethidine: cancer pain, chronic shivering; fentanyl: analgesia for a mechanically ventilated patient.

Among analgesics, tramadol was highly prescribed drug which was about 15 (18 percentage) followed by acetaminophen 13 (15.7 percentage), and sulfasalazine 11 (13.3 percentage). The off-label indications were acetaminophen: migraine, osteoarthritis; Gabapentin: Restless legs syndrome; Sulfasalazine: Crohn disease; Codeine: migraine, management of cancer related pain; tramadol: intravenous tramadol controlled shivering during cesarean section under regional anesthesia; azathioprine: Crohn disease; diclofenac: fever, post-episiotomy pain; naproxen: menorrhagia, systemic lupus erythematosus;

Out of 200 prescriptions, Study shows resulting of 8 (4 percentage) ADRs due to drug interaction and drugs involved were adrenaline, lidocaine, atracurium, tramadol with propranolol, midazolam and clarithromycin, clindamycin and fluoxetine respectively.

Conclusion: The study showed that the quiet often the anesthetic and analgesics were indicated for off-label use.

fentanyl and adrenalin was highly prescribed anesthetics and tramadol and acetaminophen was highly prescribed analgesics off-label drugs. while comparing the prevalence of ADR adrenalin, lidocaine, atracurium, tramadol with propranolol, midazolam, clindamycin and fluoxetine respectively was identified which are associated with ADR.

There was 4 percentage incidence of adverse drug reactions which includes drugs adrenalin, lidocaine, atracurium, tramadol with propranolol, midazolam, clarithromycin, clindamycin and fluoxetine respectively causing bradycardia, respiratory depression, increased neuromuscular blockade, hypertension and hyperthermia respectively.

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Session-Board # - 1-031

Poster Title: Evaluation of adverse drug reactions related clinical decision support alert overrides in the inpatient setting

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: The aim of this study was to analyze characteristics of adverse drug reactions(ADRs) related clinical decision support(CDS) alert overrides, assess the effectiveness of ADRs alert system for prevention of ADRs, and suggest methods for decreasing preventable ADRs.

Methods: In Asan Medical Center, medications with ADRs reported by health-system providers are classified “caution” and “prohibition” after conducting causality assessment of ADRs by pharmacists and physicians. When medications with ADRs are ordered, ADRs alert informed the clinicians. They can either discontinue the order or continue with the medication order by overriding the alert, which requires entering a free-text reason.

We evaluated ADRs alerts for inpatients within in our health system during a 1 year period(2017). Factors that were measured were drug and drug class that triggered alerts, frequency of override reasons, and characteristics of ADRs. We analyzed the first overridden alert within each patient and classified in two categories according to the ADRs assessment.

Results: A total of 4,101(90%) of 4,551 alerts were overridden in 259 patients with 342 medications that were classified as “caution”(295 medications) and “prohibition”(47 medications) by assessment of ADR. The average number of ADRs alerts is 15.8 per patient and 12.0 per medications. In the “caution” group, clinicians’ most common reasons for overriding alerts were “no reasonable alternatives”(39.7%), “aware/premedication/will monitor”(21.7%). While, in the “prohibition” group, they were “no reasonable alternatives”(28.6%), “patient does not have this allergy/tolerates”(24.5%), “desensitization protocol/skin test”(22.4%). Drug classes that triggered overridden alerts were antimicrobial agents(42.0%), anticancer drugs(22.3%), nonsteroidal anti-inflammatory drugs (NSAIDs)(7.4%) in the “caution” group. In

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the “prohibition” group, overridden drug classes were similar. Only 1 patient of 259 patients experienced ADRs attributed to the overridden drug and it was not serious.

Conclusion: Overrides of ADRs alerts were common but low rate of re-experienced ADRs. ADRs alert were repeated same patients and medications because of not reassessing when patients tolerates ADRs. The high rate of alert overridden was attributable to no reasonable alternatives and frequent nonexact match alerts. Based on these findings, we have made recommendations for increasing the specificity of alerting and thereby improving the clinical utility of the ADRs alerting system.

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Session-Board # - 1-032

Poster Title: Interdisciplinary medication event team's process improvement for handling of inpatient concentrated regular insulin U-500

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: The institution's interdisciplinary Medication Event Team meets weekly to review anonymously reported medication errors. Errors are categorized as actual events that reached the patient, or near miss events that were caught prior to reaching the patient. During the previous year, the team noted an increase in the number of near miss and actual medication events related to inpatient utilization of concentrated regular insulin U-500. Given the heightened risk for serious harm associated with erroneous use, steps were taken to introduce standardized procedures for ordering, preparing, dispensing, and administering concentrated regular insulin U-500 to enhance patient safety.

Methods: As part of the Medication Event Team review process, the reported errors are analyzed and scored using the Safety Assessment Code as recommended by the National Center for Patient Safety. All medication events reported between 4/1/2017 and 3/31/2018 were reviewed; medication events involving concentrated regular insulin U-500 were assessed in more detail. Using event descriptions, medication events were characterized as errors of either ordering, administering, or dispensing, and a process flowchart was created to include all relevant steps from the patient admission to administration of concentrated regular insulin U-500. Medication event information guided the development of a root cause statement and associated action plans to enact systematic improvements to prevent recurrence and improve patient safety.

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Results: There were 424 medication events during the time frame of 4/1/2017 to 3/31/2018, of which three were associated with concentrated regular insulin U-500 in the inpatient setting. The events were variable with respect to characterization, and were suggestive of systematic vulnerabilities in the ordering, preparing, and administering of concentrated regular insulin U-500. To address the variability, checklists were created for each service involved in the inpatient process. An ordering checklist was created for physicians, a preparation and dispensing checklist for pharmacists, and an administration checklist for nurses. Additionally, an inpatient pharmacy dispensing log and independent pharmacy double-check of all concentrated insulin orders were implemented for beneficial redundancy. In coordination with Nursing Education service, inpatient nurses were given an educational in-service regarding concentrated regular insulin U-500 to enhance knowledge and promote awareness.

Conclusion: Through identification and evaluation of near miss and actual concentrated regular insulin U-500-related errors, the Medication Event Team implemented systematic and standardized process improvements to optimize patient safety and avoid potential medication events.

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Session-Board # - 1-033

Poster Title: Assessing the suitability and efficacy of a single dose intramuscular methotrexate in ectopic pregnancy at a tertiary care Obstetric setting in Qatar.

Poster Type: Descriptive Report

Submission Category: Women's Health

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Purpose: An ectopic pregnancy (EP) is a condition in which the implantation occurs outside the uterine activity. Medical intervention with methotrexate is well established as an alternative to surgery. Current practice at Women's Hospital is driven by internationally accepted protocol, to administer single dose intramuscular methotrexate (MTX). Data about the efficacy of different methotrexate regimens is limited in Qatar. The study was designed to evaluate the suitability and efficacy of single-dose MTX 50 mg/m² BSA used in the treatment of EP. This study further assessed the b-hCG levels and correlate them with success rates.

Methods: The study took place at a 220 bedded obstetric teaching hospital in Qatar. The study was approved by the medical research center at Hamad Medical Corporation. Medical records of all women diagnosed with EP and treated with MTX were retrospectively reviewed for a period of nine months. Women's Hospital complies to single dose MTX protocol by Stovall et.al. that is "single dose" protocol at a dose of 50 mg/m² of body surface area. The study excluded all those patients who were treated with MTX and lost follow up for the next visit. EP was diagnosed by the obstetrician based on clinical findings and correlated with ultrasound. MTX was indicated for all patients hemodynamically stable, tubal mass of less than .5 cm, absence of fetal cardiac activity and β -human chorionic gonadotropin (β HcG) less than 5000 IU. The overall success rate was determined by normalization of β HcG after first or second dose, while the failure was defined if the patient encountered hemodynamic instability, progressing β HcG values, or severe abdominal pain after two doses of MTX.

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Results: Seventy-three patients from more than 11 different nationalities were treated with intramuscular MTX at Women's Hospital over a period of 9 months. Approximately 80% of these patients had multigravida and 25% used assisted techniques for conception. Majority of women treated were between 31 - 35 years. Twenty percentages of the patients had history of one or more previous EP. The mean pretreatment levels of (β HcG) was 2527.7 of which almost 7% had β HcG levels > IU 5000. Seventeen percentage of the patients treated had relative contraindication to the MTX treatment. Almost 60.5% of the patients had successfully achieved a β HcG < 15 IU between Day 5 and Day 7 and an additional 18% required second dose. Approximately 95% of the EP was treated below 10 weeks gestation. The overall success rate of therapeutic management with MTX was more than 75%. The study findings revealed that the prearrangement β HcG levels were significantly lower in those who responded to the single dose MTX ($P=0.023$). Gravida status, previous history of EP, location of EP was not found to be associated with the success rate of the treatment. No major adverse effects were noted during the study period.

Conclusion: The use of MTX during EP is safe and effective. Our study suggested that intramuscular MTX can be a safe alternative to surgery for hemodynamically stable unruptured tubal pregnancy. Timely detection, low (β HcG) levels and proper follow up are predictors of success.

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Session-Board # - 4-001

Poster Title: Incidence of burnout in critical care pharmacists

Poster Type: Evaluative Study

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: The Maslach Burnout Inventory for Human Services Survey (MBI-HHS) is a validated tool to assess burnout among health care workers. A recent survey of health-system pharmacists indicated burnout is as high as 50%. The intensive care unit (ICU) environment has been associated with higher risk for burnout compared to other health care personnel. It is currently unknown whether critical care pharmacists experience a higher rate of burnout. The aim of this study was to determine the prevalence of burnout among critical care pharmacists and determine potential risk factors for the development burnout.

Methods: IRB approval was obtained and jointly approved by ASHP for distribution. An electronic qualtrics survey was distributed via email to critical care pharmacists, as designated within the ASHP membership services database. Participation was voluntary and consent was obtained. The survey included demographic questions, institutional and staffing characteristics, and the unmodified, 22-question, MBI-HHS survey. Upon completion, respondents received personalized results, based on their responses, indicating their risk of burnout. Emotional Exhaustion Scores > 27; Depersonalization Scores > 10; or Reduced Personal Achievement Scores < 33 in any of the three subscales were considered at risk of burnout. Multi-variate logistic regression was performed to assess for risk factors using years in practice, hours worked weekly at work and at home, number of ICU patient beds, average orders verified daily, availability of resources for resiliency or burnout at institution.

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Results: Of 3196 surveys sent, response rate was 6.2%. A majority of respondents were female (62%), Caucasian (80%), and married/partnered (62%). The median age was 34 years. A large proportion of respondents had been practicing for less than 5 years (43%) and 6-15 years (32%). Common primary work areas included mixed Medical/Surgical units (25%), Medical ICU (20%), and the Emergency Department (14%) with a median number of patient care beds covered of 24 (IQR 16-30). Median medication orders verified per shift were 80 (IQR 25-150). Approximately 73% of respondents, worked longer than 50 hours per week. For the primary outcome, 123/193 (64%) respondents met the criteria for burnout on one of the three burnout subscales. Only 14.5% of respondents identified resources for burnout were available at their institution. Using multivariable logistic regression, no single risk factor was determined to be significantly associated with burnout.

Conclusion: In this survey of critical care pharmacists, burnout was as high as 64%. Respondents were notably earlier in their career, tended to work more than 40 hours per week, and were not aware of institutional resources for burnout. No single risk factor was determined to be significantly associated with burnout. It is important to consider that pharmacists who are more concerned about or experiencing burnout may have been more likely to respond. However, given high rates of burnout in other critical care professions, It is essential to create awareness of and provide resources for preventing burnout within critical care pharmacy.

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Session-Board # - 4-002

Poster Title: Innovative residency and fellowship program narrows leadership gap; a view from key stakeholders

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Evidence demonstrates that we are facing a shortage of trained pharmacy leaders. Seasoned leaders at the American Society of Health-System Pharmacists (ASHP) recommend more robust succession management strategies to mitigate this leadership shortage. We have developed an innovative residency and fellowship program with a Masters in Health Administration (MHA) that appeals to our health-system, our partner college of pharmacy, and residency candidates. This descriptive report will demonstrate value and outline the new Health-System Pharmacy Administration Residency and Fellowship Program from the perspective of key stakeholders.

Methods: With a focus on succession management within our local service area (two community hospitals within a health-system), we worked with a local college of pharmacy to design a unique Health-System Pharmacy Administration residency and fellowship program. The program advocated for a PGY1/PGY2/MHA, followed by a final third fellowship year for residents to learn through leadership experience. The program was approved by Executive Leaders in 2015 and our first resident began the program in 2016. The MHA is completed at a local college of pharmacy during the PGY1 and PGY2 years, at no cost to the resident. We utilized the PGY2 standards from ASHP and will refine our program with recent feedback from our ASHP Accreditation Survey. Our program has matched a resident each year for three years, and we look to make continuous improvements to make it a sustained success.

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Results: We will demonstrate our rationale for designing a comprehensive residency and fellowship program which also offers an MHA. New residency programs bring new challenges, which will be discussed as well. We will summarize significant residency projects, to include their financial and educational benefits. With improved quality and service in mind, we discuss the potential for increased capacity of staff, enhancement of achievement of senior leadership goals and objectives, and expansion of pharmacy services through this new program. Finally, we will describe the benefits from the view of our organization, prospective candidates, residents and administrative fellows, and also from our local partnering college of pharmacy.

Conclusion: With more pharmacy leaders needed, and immense support from our executive leadership team, we successfully implemented a new Health System Pharmacy Administration Residency and Fellowship Program spanning over three years. Benefits are being realized, demonstrated and refined. Creative solutions such as this program will narrow the leadership gap with succession planning through residency and fellowship program development. This overview demonstrates how designing a highly functioning residency and fellowship training program with key stakeholder perspectives in mind can lead to sustainable financial and educational benefits.

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Session-Board # - 4-003

Poster Title: Sterile compounding workflow optimization to conserve fluids and reduce waste in the setting of drug shortages through the use of IV workflow software

Poster Type: Evaluative Study

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: The profession of pharmacy is under constant pressure to provide optimal care with limited resources. Internally, these challenges may include tasks such as meeting drug and personnel budgets within one's institution. More recently, external challenges such as drug, fluid, and supply shortages have had a profound impact on our ability to care for patients. This project assesses the impact of IV workflow adjustment through the use of IV workflow software by tracking wasted compounded sterile products before and after implementation.

Methods: All expired pharmacy prepared compounded sterile products were collected and recorded in 7 day "Waste Week" intervals 6/19/17 to 6/26/17 (Week 1) and 11/13/17 to 11/20/17 (Week 2). The first week served as a baseline to measure wasted compounded sterile drug product. Workflow software was then implemented 10/9/17, and workflow processes were evaluated and modified in a manner that would have the greatest impact to reduce waste. An effort was made to move as close as possible towards a "just in time" compounding model given current staffing schedules. Prior to the use of the workflow software, items to be compounded were determined using paper profiles and printed labels. The workflow was often determined at the discretion of the compounder. The software is designed to display items to be compounded in an electronic queue streamlining a very manual and cumbersome process. Costs of wasted medication were calculated from our medication wholesaler as of 6/30/17 (Week 1) and 11/22/17 (Week 2), respectively. Compounding time was not used to calculate labor savings given the variability of compounding time between products. Midnight patient census was recorded during these waste weeks to standardize waste as "cost per patient day" as fluctuating census could affect total amount of wasted products. Cost savings per year was calculated based upon average midnight census 1/1/2018-3/31/2018.

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Results: During Week 1, the total dollar amount of wasted compounded sterile products was recorded as \$1444.52. During Week 2, a total dollar amount of wasted medication of \$615.84 was recorded. As a result, a total cost savings of \$828.68 was observed between Week 1 and Week 2 due to reduced waste. The difference was calculated to be a cost savings of \$1.51 per patient day. This represents an annual cost savings to the pharmacy drug budget of greater than \$32,000.

Conclusion: The use of IV workflow software resulted in significant reduction of sterile compounding waste at our institution. This led to significant cost savings as well as conservation of fluids during widespread shortages.

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Session-Board # - 4-004

Poster Title: Courtesy medication assistance

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Providing access to medications to indigent patients is costly and is a challenge that case management, hospital administrators, and hospital-based pharmacies encounter daily. Past practices allowed for patients to simply state their inability to pay for a medication, creating an atmosphere of behaviors where patients put other priorities ahead of purchasing medications. New regulations on nondiscrimination and accessibility require that each patient receive consistent treatment based on standardized practices. This project developed standardized guidelines to provide courtesy medications to patients unable to pay as well as reduce the financial burden of courtesy medications on the health system by 35 percent.

Methods: A multidisciplinary team was formed and investigated how courtesy medications were distributed at other healthcare centers. The internal annual expense of courtesy medications over an 11 month period was assessed and analyzed by therapeutic category to determine those most frequently dispensed and with the greatest expense. The pharmacy team members developed a color-coded formulary for easy identification of approved courtesy medications. Most affordable medications for the patient were coded green, moderate affordability were coded yellow, and the expensive medications were coded red. The red coded medications were also identified as medications that would need approval by senior hospital administration when prescribed due to subsequent cost for refills and the likelihood for non-compliance. Providers were educated to prescribe medications in the green list, when possible,

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to provide the best opportunity towards facilitating affordable medication management instead of returning to the emergency department refills.

Next was to determine criteria to qualify a patient for courtesy medications. An interview process was developed to include scripting that informs patients of the discount prices offered promoting patient financial responsibility. During the implantation, the case manager interviewed patients to discuss options such as friends, family, and community resources that might be willing to help pay for medications. Additional options such as patient assistance programs and free trials were explored prior to determining if the patient is eligible to receive courtesy medications.

Results: Data was collected and analyzed weekly for patient insurance status, documentation to reflect discussion about medication affordability and options, prescribed medications, and cost of medications to the hospital. Continued education was given and shared during weekly meetings. The cost savings comparing the time period of May to December 2016 to 2017. The cost of courtesy medication expenditure was decreased by just over \$100,000, a 54 percent reduction during the 7 month period.

Conclusion: Implementation of standardized guidelines and a process for distributing courtesy medications to patients unable to pay resulted in improved access to affordable new prescriptions and resources for obtaining refills as well as a reduced financial burden to the health-system.

Conclusion: Implementation of standardized guidelines and a process for distributing courtesy medications to patients unable to pay resulted in improved access to affordable new prescriptions and resources for obtaining refills as well as a reduced financial burden to the health-system.

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Session-Board # - 4-005

Poster Title: Improving bedside medication delivery program to increase prescription capture rate and expedite patient discharges

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Hospital-based outpatient pharmacies are underutilized by inpatient providers writing discharge prescriptions. Well-run bedside medication delivery programs can capture approximately 60 percent of discharge prescriptions. At this community hospital only 5% of discharge prescriptions were filled in the outpatient pharmacy. The purpose of this project was to improve patient satisfaction by delivering medications and expediting discharge while maximizing revenue in a hospital-based outpatient pharmacy. The primary goal of the project was to increase utilization of the hospital-based outpatient pharmacy. A secondary goal was to decrease the number of paper prescriptions by encouraging electronic prescribing to expedite delivery and patient discharge.

Methods: The workflow of the outpatient pharmacy was reorganized to dedicate staff to the bedside program. Standard rounding times were implemented based on an analysis of peak hospital discharge times. During rounds, pharmacy staff deliver filled prescriptions to patients, stop at each nurse's station to collect written prescriptions and inquire about pending discharge patients. The staff member also used this time to promote and enroll patients into the bedside program. A survey was also developed and distributed to nursing staff to gain insight into their perception of the bedside program and identify areas for improvement. Next, alternate methods for filling discharge prescriptions and potential barriers to using the hospital-based pharmacy were explored. Opportunities identified included resolving payment barriers

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and electronic prescribing of medications. An analysis on the number of written, faxed and electronic prescriptions revealed a pivotal component to this process improvement. The team identified that providers were not electronically prescribing medications slowing the delivery of medications to the bedside. The team educated the providers related to the delays with written prescriptions, introduced the pharmacy's process to resolve payment barriers, and leveraged upcoming legislation which will require any controlled substance containing an opiate to be prescribed electronically.

Results: This project has resulted in an increase from a 5% discharge prescription capture rate to 41% (8.2 fold increase) of all discharge prescriptions being filled by the hospital-based outpatient pharmacy. The increase contributed to \$544,031 of gross revenue over the past year. In addition, the proportion of prescriptions transmitted electronically increased from 63 percent to 87 percent and the goal of reducing the number of written prescriptions received by the pharmacy was achieved.

Conclusion: Implementing strategies and processes to improve the awareness and efficiency of a bedside discharge medication program was associated with a significant increase in the number of prescriptions filled by the hospital-based outpatient pharmacy and an increase in utilization of electronic prescribing. These improvements led to decreased prescription fill turnaround time and increased profit for the institution.

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Session-Board # - 4-006

Poster Title: Implementation of premixed bivalirudin in a community-hospital cardiac catheterization laboratory

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

Primary Author: Rachel Cordrey; Peninsula Regional Medical Center;

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Purpose: The Food and Drug Administration approved bivalirudin in 0.9 percent sodium chloride in January of 2018. This product is supplied as a frozen premixed, iso-osmotic, sterile solution in a GALAXY container. The use of premixed intravenous products is preferred from both operational and regulatory standpoints, for a variety of reasons. This ready to use formulation saves nursing time in preparation of the medication, and eliminates potential errors that could occur during point of care admixing. The purpose of this study is to examine the potential of leveraging premixed bivalirudin in the cardiac catheterization lab.

Methods: Current state processes for bivalirudin utilization in the cardiac catheterization lab were mapped from both a nursing and pharmacy perspective, using gemba. During the gemba, nursing was observed pulling bivalirudin vials from the automated dispensing cabinet, reconstituting, administering, and charting. In many cases, nursing did not follow the package insert instructions, nor did they follow a standardized process for reconstitution of the bivalirudin vials. For example, one nurse described her work flow as using a sodium chloride flush to reconstitute the vial and push the bolus dose. The use of sodium chloride flushes to reconstitute and push medications has been noted as an unsafe practice by the Institute for Safe Medication Practices, as unlabeled flushes containing medications have led to serious errors and patient harm. In addition, a comprehensive financial analysis of both bivalirudin formulations was performed in a 340b disproportionate share environment. One of the key considerations in analyzing the premixed product was the 14 day beyond use date once thawed. Waste elimination is crucial from an operational and financial standpoint. Utilization reports from automated dispensing cabinet were analyzed to determine appropriate max and par levels for each cardiac catheterization lab.

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Results: After reviewing results from the gemba and the bivalirudin financial model, key opinion leaders from pharmacy and nursing decided to implement the premixed bivalirudin product in the cardiac catheterization lab. While the wholesale acquisition cost of the premixed product is slightly more expensive, 340b pricing drives the overall cost of the premixed product below the cost of the vials for our institution; an estimated savings of 1,027 dollars annually. Pharmacy and nursing processes were re-mapped based on the change from bivalirudin vials to premixed product. The largest barrier to implementation was lack of confidence using a new product. It took about a week for staff to become comfortable with a new workflow; they now use the infusion pumps for both the bolus and infusion doses. Premixed bivalirudin was placed in the automated dispensing cabinet's refrigeration units with a sufficient inventory based upon historical utilization to avoid both stock outs and wasted product. Alignment of the electronic health record, smart infusion devices, and other systems were taken into account during the product transition. No update was needed for infusion pumps; the premixed product is supplied in the same concentration as previous state when nursing was mixing on demand, 250mg/50mL and 500mg/100mL.

Conclusion: Successful implementation of a premixed intravenous product, such as bivalirudin, involves proper planning with affected departments. A key to success is performing a current and future state process map involving the front line staff, including gemba. Feedback from cardiac catheterization lab staff post implementation has been very positive. Premixed bivalirudin saves time staff would have spent reconstituting and preparing the medication for administration. It also reduces the potential for errors in a procedural area where staff are working under the restraint of time to provide quality care.

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Session-Board # - 4-007

Poster Title: Implementation of a radiofrequency tagging system to manage drug kits and trays

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Improved efficiency increases overall quality. Replenishing drug kits is a time-consuming and labor-intensive process. An evaluation was conducted before and after implementation of a simple radiofrequency (RFID) tagging system to restock and check drug kits in order to evaluate impact on efficiency.

Methods: The RFID tagging process was implemented over a weeklong period beginning on October 2, 2017. Prior to implementation, technician and pharmacist time requirements in replenishing and checking drug kits were measured by breaking down each step in the pre-implementation process and measuring the time of each step. In early June, this method was repeated for the post-implementation process. On June 1, 2018, data was extracted from the database linked to the RFID scanner including the number of times each drug kit was scanned and the total number of items replenished. Total pre- and post-implementation times were determined for both pharmacists and technicians. Base salaries of full-time employees were utilized to calculate a manpower cost. The initial investment in manpower and RFID tags were considered and overall time and cost savings were calculated. These calculations were annualized.

Results: The implementation cost was estimated at approximately \$11,000. Over the study time period, 410 active drug kits were utilized; 27 kits were processed and 762 individual items were scanned on daily average. The annual manpower cost of the pre-implementation process was found to be a total of 1,243 hours for an estimated cost of both pharmacists and technicians of \$44,100. In comparison, an annualized post-implementation time of 314 hours for a total cost of \$7,520 was observed. Although not measured, the new process was perceived to enhance staff satisfaction. Other institutions have reported additional benefits of

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RFID tagging including inventory control and drug-recall management. Benefits were observed when confronted with recalls of kit items. The new process permitted pharmacy to rule out the presence of items announced on several recalls; thus, the need to manually check all kits was avoided. The recall process became less time-intensive and more focused. A process to prevent waste of soon-to-outdate items existed prior to implementation. Optimization of kit contents occurred before launching the new process. An enhancement to permit kit tracking is desired.

Conclusion: The RFID tagging process improved time and cost efficiency. This evaluation demonstrated 75% time and 83% cost savings. Savings was especially pronounced for pharmacists—89% time and 93% cost savings. After accounting for the annual cost of the RFID tags, an annual cost savings of approximately \$17,664 is anticipated. Improved drug recall processes were noted after implementation.

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Session-Board # - 4-009

Poster Title: Transition from intravenous infusion to intravenous push administration of selected antibiotics as a clinically neutral cost savings measure

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: In September 2017, Hurricane Maria struck Puerto Rico wiping out the island's electrical grid and crippling one of the United States' only manufacturers of intravenous fluids. The resulting national shortage of these fluids triggered hospitals around the country to seek out ways in which to decrease their overall utilization without negatively impacting either patient care or overall costs. While our 186-bed rural New York hospital had already been considering transitioning several of our antibiotics from intravenous piggyback infusion to intravenous push administration, these events led us to move up our implementation timeline by several months.

Methods: We conducted an extensive review of the current literature and our rate of utilization of specific antibiotics that were both affected by the intravenous fluid shortage and appropriate to be administered via intravenous push and decide to start with an initial set of five antibiotics: aztreonam, cefazolin, cefepime, cefoxitin, and ceftriaxone. After providing both written and live education to pharmacy staff, nurses, and providers, we conducted a month-long pilot study in our operating room with no remarkable issues. The program was next rolled out in our emergency department for another one month trial before finally moving facility-wide after additional training was provided to appropriate staff members. We implemented a standardized plan by which each of one gram of the antibiotic would be diluted in ten milliliters of sterile water for injection. The total dose would then be administered via intravenous push over three to five minutes.

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Based on the favorable cost differential between the intravenous fluid bags of normal saline we had been using to administer the antibiotics and the vials of sterile water for injection that we had transitioned to, we estimated that, if our utilization remained consistent and followed historical norms, we would save \$6,000 in one year. We evaluated pharmacy technician time for preparation and nursing time for administration to ensure that workload would not be negatively impacted by the change.

Results: During the first six months of using the intravenous push route, 8,734 doses were administered. The majority were cefazolin for surgical prophylaxis (3,521 doses) or ceftriaxone (3,694). This is a higher number of doses than was predicted. The increase has been attributed both to a higher than average hospital census during the study period and efforts by the pharmacy staff to encourage use of one of the intravenous push antibiotics when clinically appropriate in order to conserve intravenous fluid bags which have remained on national shortage.

No negative clinical outcomes have been credited to the change in method of intravenous administration. Only one adverse reaction has been reported which was noted as redness and warmth at the injection site. The hospital's intravenous to oral medication transition process has remained in place with no issues. Prior to implementing the change, the antibiotics were mixed in fifty or one hundred milliliters of normal saline costing \$1.27 and \$2.47 respectively. The doses were transitioned to have each one gram of antibiotic diluted in ten milliliters of sterile water for injection at a cost of \$0.77. The cost differential coupled with the higher than predicted utilization led to a total savings of \$8,811.83.

Conclusion: Transitioning from intravenous infusion to intravenous push administration of specific antibiotics for which good safety and efficacy data exist has proven to be an effective way to decrease utilization of intravenous fluid bags which have remained on national shortage since late 2017. While it was not the primary reason for implementing the change, the practice has also led to a significant overall cost savings while not increasing adverse effects or having a negative impact on clinical outcomes or workflow. We will continue this practice even after resolution of the national shortage and evaluate other antibiotics for potential inclusion when applicable.

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Session-Board # - 4-010

Poster Title: Optimizing purchases by leveraging sub-wholesale acquisition cost contract pricing at a 340B covered entity

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: The 340B Drug Pricing Program was enacted with the intent of stretching scarce federal resources as far as possible to reach more eligible patients and provide more comprehensive services. Covered entities (CEs) subject to the Group Purchasing Organization (GPO) Prohibition, may utilize the Prime Vendor Program's sub-wholesale acquisition (sub-WAC) contract pricing in the non-GPO/WAC accounts to maintain inventory compliance and use when financially cost-effective. One method of optimizing purchasing is to utilize sub-WAC pricing when it is lower than GPO pricing. CEs utilizing split-billing software without capabilities of real-time cost comparisons can perform analyses to identify financially beneficial opportunities.

Methods: On a monthly basis, the following items are exported and entered on separate tabs in a dashboard generating workbook (DGW): (1) product pricing catalogs for 340B, GPO and WAC accounts from the wholesaler, (2) purchase history for last 365 days, and (3) current active sub-WAC item listing. On the master tab, a listing of all items uses NDC data to query current prices from each respective product pricing catalog tab, purchase history, and the active sub-WAC item listing. Items are identified for inclusion for sub-WAC item listing based on the following criteria: (1) sub-WAC price has at minimum \$10 savings per package compared to GPO, (2) sub-WAC price savings is at minimum 10% compared to GPO, and (3) the NDC has been purchased within the last rolling 365 days. A final listing of items is compiled and uploaded to the third-

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party administrator split-billing software which then redirects purchases of these items to the WAC account if initially directed to the GPO account. Active sub-WAC items are also analyzed for continued inclusion and are removed if the inclusion criteria are no longer met.

Results: Purchase history from January 2017 through April 2018 was analyzed. Items purchased under WAC accounts were flagged by month based on inclusion criteria. Of identified items, the average savings per month achieved by sub-WAC pricing prior to implementation was \$7,460.81. After implementation, the average savings per month achieved by sub-WAC pricing was \$34,831.53.

Conclusion: Creation of a DGW to analyze sub-WAC pricing can be a cost-effective benefit for CEs subject to the GPO Prohibition.

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Session-Board # - 4-011

Poster Title: Rationale and cost savings of a conversion to fluticasone-vilanterol inhaler in a large health system

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Sentara Healthcare is a not-for-profit health system serving Virginia and North Carolina, with 12 hospitals and more. Because pharmaceutical expenditures account for a significant portion of the organization's operating budget, drug spend analysis is a way to help decrease operating budgets. The inhaled corticosteroid/long-acting beta-agonist inhalers (ICS/LABA) inhalers spend was identified as one of the top drug spends, top increasing drug spends, and was considered elevated because of the cost of the fluticasone-salmeterol discus inhalers. Due to these trends, the pharmacy department developed a cost savings initiative to reduce inpatient drug spend by therapeutically interchanging the fluticasone-salmeterol to fluticasone-vilanterol inhaler.

Methods: A top down spend analysis was completed using a spend analytics tool to identify potential cost saving opportunities. Once the interchange opportunity was identified, an interdisciplinary team of pharmacy staff, pulmonology physicians, respiratory therapy staff, and finance personnel was formed to further evaluate the opportunity. Pharmacy first educated the pulmonary physicians on the financial opportunity and surveyed them to see if this interchange was therapeutically acceptable. Once the physicians agreed, the P&T Committee voted to approve the interchange. The respiratory therapists were educated on use of the inhaler and after go-live they educate patients on proper administration with the initial inhalation dose. Subsequent doses are administered by nursing who are also encouraged to properly store inhalers in designated area. ICS/ LABA inhalation therapeutic interchange was activated in the EMR inpatient computer system and entered new orders. Previously dispensed inhalers were not converted as a part of the implementation. Buyers purchased inhalers in advance of the

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conversion to ensure adequate supply. The institutional 14 day device for both inhalers was used.

Retrospective financial monitoring of this initiative was performed using EMR reports and wholesaler spend analytics tool.

Results: Physicians began ordering the new inhaler in July 2017. The first 11 months after implementation (July 2017 to May 2018) showed a 32% (-\$597,782) decrease in drug spend for these products compared to the same 11 months the previous year. Purchase volume showed a slight 4.7% (-697 units) decrease during the same 11-month timeframe, but accounts for less than 4% of the savings. This dramatic decrease in inpatient medication spend after implementation of the therapeutic interchange is attributed to enhanced contract price per inhaler, utilization of the 340B/DSH pricing and decrease in waste.

Patients with ICS/LABA ordered increased 5.2% (+ 566 patients) from 10,782 to 11,348 while the number of inhalers charged to inpatients remained neutral at 14,121 to 14,026.

Moving from fluticasone-salmeterol twice daily inhalation to equally efficacious fluticasone-vilanterol once daily inhalation reduced nursing time, drug waste, and increased compliance.

Conclusion: The ICS/LABA inhalation therapeutic interchange initiative reduced the inhaler purchase dollars by 32% (-\$597,782) while the number of patient with ICS/LABA orders increased 5.2% (+566). Converting from a twice daily inhaler to a once daily inhaler also decreases nursing time and encourages patient compliance. Hospitals should consider a collaboration between pharmacy, pulmonologist and health care workers to assess the opportunity to decrease inpatient inhaler cost through a formulary change.

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Session-Board # - 4-012

Poster Title: Quantifying costs of high dollar pharmaceutical expenditures in light of a 340B drug pricing program in a county health system

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: The 340B Drug Discount Program is a US federal government program created in 1992 that requires drug manufacturers to provide outpatient drugs to eligible health care organizations and covered entities at significantly reduced prices. The 340B program enables covered entities to stretch scarce federal resources to reach more eligible patients. This county health system is one of those covered entities that benefits greatly from 340B drug pricing. Identifying significant shifts in drug expenditures and prescribing patterns when compared to national pharmaceutical trends help health systems anticipate pharmaceutical spending.

Methods: National drug expenditure trends were reviewed for baseline information. Top drug expenditures combined for inpatient, outpatient and clinic administered were evaluated. A purchase history report from the system wholesaler for one fiscal year and direct purchase orders were compiled and analyzed. Data from top purchases for three inpatient facilities and fifteen outpatient facility expenditures were compared to national pharmaceutical trends. Top purchases for inpatient facilities were compared to national pharmaceutical expenditures for nonfederal hospital systems. Trends for outpatient facilities were compared to national outpatient pharmaceutical trends. Clinic administered medications were compared to national clinic pharmaceutical trends. Specialty drugs were identified in top pharmaceutical expenditure and compared to national trends. The report characteristics included drugs purchased by generic and brand name, quantity, national drug code, and cost. Combined totals were calculated and trended by inpatient and outpatient purchases. Drugs were categorized by

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specialty pharmacy designation using a recognized national specialty drug list. Therapeutic classes of drugs were compared to national trended pharmaceutical spend.

Results: A total pharmaceutical expenditure of eighty-five million in a fiscal year for a county health system. Thirty-eight percent of the expenditure was for inpatient drugs and sixty two percent for outpatient drugs. There are free programs for indigent patients that are not a part of the pharmaceutical expenditure. Top expenditures inpatient include rituximab, alteplase, vancomycin, influenza vaccine, trastuzumab, vasopressin, calcitonin, clofarabine, darbepoetin, and amphotericin B liposome. Top expenditures for outpatient include bevacizumab, pegfilgrastim, trastuzumab, elvitegravir-cobicistat-emtricitabine, abacavir-dolutegravir-lamivudine, intravenous immune globulin, infliximab, pertuzumab, cetuximab, and rituximab. Thirty seven percent of outpatient expenditure is for oncology drugs and twenty four percent represent antimicrobial agents whereas for inpatient, only twenty two percent is oncology and twenty one percent for antimicrobial agents. Top expenditures identified nationally across all sectors included adalimumab, insulin glargine, etanercept, and ledipasvir-sofosbuvir. Due to penny pricing of adalimumab and insulin detemir, the health system benefited from 340B pricing and implemented therapeutic interchanges for these more cost effective agents, while ledipasvir-sofosbuvir was provided free through patient assistance program. Clinic administered medication trends were similar to national because mostly oncology agents were provided in an infusion setting. Inpatient trends were similar to national trends since there was no 340B pricing available.

Conclusion: Specialty drugs are a significant portion of the pharmaceutical budget. Specialty drugs represent sixty percent of the outpatient expenditure and twenty eight percent of inpatient expenditure for a combine total of forty nine percent. Understanding pharmaceutical trends enable health systems to provide budget projections in lieu of the impact of 340B pricing. The 340B Drug Discount Program results in unexpected shifts in pharmaceutical expenditure trends for a county health system. Due to 340B pricing, top expenditures for a county health system, were different when compared to national trends.

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Session-Board # - 4-013

Poster Title: Post implementation analysis: Impact of intravenous automation systems on health-system pharmacy operations

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Many health-system pharmacies have implemented, or are considering some form of intravenous (IV) automation and/ or compounding system in their clean rooms to reduce pharmacy errors and improve accuracy, productivity, and workflow. Manufacturers tout that automated systems, used appropriately, will aid in reducing errors from reaching patients. Additionally, IV admixture automation is one of the most recent areas where technology has been added to pharmacy workflow. The goal of this study is to review key areas assessed by pharmacies prior to implementation and experiences realized following intravenous automation system implementation in terms of quality, safety, productivity, and financial impact.

Methods: An anonymous survey questionnaire was created and provided to 354 pharmacy administrators or pharmacy staff that had direct supervisory roles for IV rooms across the United States through targeted email invitations. Additionally, to increase participation, respondents were targeted using anonymous participation requests and links on the ASHP Practice Management, Pharmacy Informatics, and Medication Safety Officer discussion boards and using additional databases that contain pharmacy management information for mid to large size hospitals. A survey question was included to verify respondents had adopted IV automation technology, and only those who answered in the affirmative were asked to complete the full survey. This survey instrument consisted of a total of 45 questions targeting 4

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key areas: quality, medication safety, productivity, and financial impact. Demographic information about the respondents and the respondents' practice setting was also included. The survey was administered using the Qualtrics® survey platform and data were recorded anonymously.

Results: Of those contacted, 82 attempted the survey, 48% (n=39) met inclusion criteria of having IV room automation. 37% of respondents (n=13) had practiced in the site for more than 10 years and 60% (n=21) for more than 5 years. 60% (n=21) of respondents had automation installed within the past 3 years. A wide array of IV automation systems was implemented, consisting of at least 10 different manufacturers and 2 “home-grown” systems. Only 22% (n=6) of automated products went through a formal return on investment analysis. More than half of respondents indicated they were unable to answer items related to break-even or fiscal return. Of those who could provide this information, 82% (n=9) indicated either limited or no savings were achieved. In terms of volume, nearly 43% (n=10) of facilities processed more than 300 IV products daily through automation. More than two-thirds of respondents indicated the number of personnel was unchanged post-implementation. Although most had forecasted a decrease in medication errors, 71% (n=10) could not estimate actual error rate changes after implementation. The top benefit of automation was the ability to handle increased volumes efficiently and accurately though 70% (n=7) indicated that technology had no measurable impact on IV room outsourcing.

Conclusion: A large proportion of respondents indicated their facility did not conduct formal ROI analysis before IV automation implementation. A majority selected ‘do not know’ for the financial questions may suggest that direct cost savings is not a primary consideration for IV room adoption decisions. Most indicated manufacturers had projected medication error reductions, yet few were able to identify measurable reductions. With few exceptions, staffing changes did not occur as a result of automation. Results indicate automation allows hospitals to meet increasing volumes and expansion yet 70% (n=7) indicated it has not led to a direct reduction in purchasing outsourced products.

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Session-Board # - 4-014

Poster Title: Utilizing purchase data to compare opioid usage between acute care facilities within a regional group purchasing organization.

Poster Type: Evaluative Study

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: With increasing concern about the opioid epidemic and appropriate opioid prescribing, any resources or tools available to evaluate current state of practice are needed to ensure the safety of patients. Members of a regional group purchasing organization (GPO) requested a comparison of opioid purchase history of both intravenous and oral medications within their institutions. The GPO's aim was to develop analytical benchmarking tools to assist hospitals in tracking and trending opioid utilization between acute care facilities.

Methods: Opioid purchase data was collected through the wholesaler, manufacturer, supplier, or member. All opioid formulations were converted to morphine equivalents to evaluate variable drugs and dosage forms equally. Member hospital opioid usage was separated by intravenous (IV) and oral (PO) dosage forms and then benchmarked against a hospital statistic that was weighted and adjusted according to acuity. Hospitals were compared against like sized institutions as morphine equivalents per patient days using graphs to display trends in opioid usage.

Results: Member hospital intravenous opioid usage ranged from 1,075.46 to 1.33 morphine equivalents per patient days in large hospitals, 55.32 to 2.82 in medium hospitals and 60.55 to 2 in small hospitals. Oral opioid usage ranged from 121.43 to 4.8 morphine equivalents per patient days in large hospitals, 47.89 to 0.5 in medium hospitals, and 53.41 2.9 in small

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hospitals. Hospitals are able to use this data to compare their opioid use to similar sized hospitals and make appropriate changes to their prescribing methods to decrease opioid use.

Conclusion: Members of the regional GPO can benefit from continuous monitoring and trending of opioid usage within their institution. Using comparative analytics to benchmark like sized hospitals against each other provides assistance to improve policies and procedures surrounding opioid prescribing and use. Further, members can use the tools created to perform a deeper drill down to meet specific needs.

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Session-Board # - 4-015

Poster Title: Application of kaizen philosophy to improve pharmacy operations in a community hospital

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Kaizen is a Japanese business philosophy which facilitates positive change through continuous improvement that is sustained over time to achieve measurable outcomes. Upon leadership change at a mid-sized community hospital in rural Virginia, it was determined that many opportunities existed to enhance the operational efficiency of the department, while improving provided service levels. This case presents the methods utilized to analyze the existing departmental functions and to engage all levels of pharmacy staff and other key stakeholders in designing changes to eliminate waste and improve processes.

Methods: An experienced Kaizen facilitator was assigned to guide this project. Interviews were held between the facilitator and pharmacy leadership to evaluate baseline operations and identify areas that required interventions. Based on identified opportunities, the project was divided into phases. Fundamental to the Kaizen approach is empowering those doing the work to design the improvements. There were three separate multi-day Kaizen workshops set up for individuals with expertise in different areas to interact, and plan changes. In all there were over three-hundred years of hospital pharmacy experience represented. Participants included pharmacy technicians, staff pharmacists, clinical specialists, the purchasing agent, and pharmacy management. Additionally, key stakeholders were involved from other departments, including nursing, supply chain, and the operating room. The focus was to eliminate non-value added activities while maximizing value added and required activities. The goals of phase one were related to inventory management. We strove to improve automated dispensing device efficiency to greater than ninety percent, decrease inventory by twenty-five percent, and increase inventory turns by one-third. Phase two focused on personnel management with goals

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of clearly defining roles and responsibilities, redesigning staffing models, standardizing processes, reducing the time required for manual cart fill by twenty-five percent, and to develop contingency plans with cross training. The final phase involved implementation of automated dispensing work stations in all operating rooms and procedural areas, with one-hundred percent utilization.

Results: Many interventions were immediately successful; allowing us to achieve measurable goals quickly. Automated dispensing device efficiency improved from a baseline of eighty-one percent to ninety percent within three months. Over time this value has fluctuated, having been negatively impacted by drug shortages. Inventory reduction has been successful with a thirty percent reduction in inventory within six months of intervention implementation. As purchases and inventory decrease, the net effect on inventory turns was only a modest increase. The decrease in inventory should be viewed as a lead indicator of inventory turn increases. Phase two results have been positive. Few roles are now one-person dependent, although continued cross-training is required to maintain depth of staff competency, with personnel turn-over. The time required for manual cart fill of non-automation stocked medications decreased twenty-five percent within three months of optimization, and process simplification. Thanks to hospital administration support, stakeholder input by the operating room staff, and anesthesiologists, we achieved one-hundred percent utilization of dispensing automation in the operating room and procedural areas within three months. Opportunities still exist to improve accuracy in this distribution model.

Conclusion: The Kaizen approach to process improvement has been highly effective at improving the pharmacy department's operational efficiency at this two-hundred fifty-five bed community hospital.

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Session-Board # - 4-016

Poster Title: Financial impact of ambulatory care pharmacists in primary care

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Ambulatory care pharmacists (ACPs) within Sutter Medical Foundation Clinics in the Sacramento region provide comprehensive medication management (CMM) to patients with comorbidities and multiple drug therapies. CMM is conducted during patient visits in addition to the existing role of pharmacists in this setting in transitional care management. Although pharmacist services have been shown to improve outcomes and reduce costs, the financial sustainability of these services may become a barrier to further expansion of ACP-led programs. The project objective was to evaluate the financial impact of pharmacist provision of CMM in the primary care setting for select high risk patients.

Methods: The institutional review board approved this multi-clinic retrospective chart review evaluation designed to describe financial impact of ACPs in primary care. Standardization of work for the three ambulatory care pharmacists, each associated with a different primary care clinics, was completed by December 2017. Data was collected between January and March 2018. In the primary care clinics, providers may refer patients to pharmacists who may benefit from CMM and jointly see the patient during the same office visit. These combined encounters receive reimbursement through an “incident to” billing model utilizing current procedural terminology (CPT) code. Patient demographic information collected included age, gender, number of chronic conditions, number of documented medications, and number of previous emergency department and hospitalizations in the past year. Additional data tracked included location of clinic visit, pharmacist time spent on direct patient care and documentation, pharmacist interventions and provider acceptance, CPT coding for each visit, and revenue generation based on the visit coding. Costs extracted from literature were correlated to pharmacist interventions to calculate cost avoidance estimations. A physician satisfaction

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survey was distributed at the end of the evaluation time frame with the intent to understand potential impacts on provider efficiencies, satisfaction with the services, and likelihood of continued collaboration with ACPs to utilize the CMM services.

Results: Three ACPs collaborated with eighteen providers throughout eight clinics. CMM was provided for 171 patients in combined office visits between January and March 2018. Time spent on direct patient care and documentation averaged nine hours weekly or 0.2 full time equivalents (FTE) for all three pharmacists, with each contributing up to four hours weekly. The average time each pharmacist spent on direct patient care per patient was 23 minutes. Each patient had an average of five chronic conditions and took an average of thirteen medications. The most common CPT code billed was 99214 followed by 99215 and 99213. Total reimbursement was \$19,126, projected over three months or \$76,504 annualized. ACPs made 391 recommendations to both providers/patients and 221 were made specifically to providers. 87% of recommendations were accepted. The most commonly cited interventions included 1) Medication reconciliation, 2) Added medication, and 3) Therapy change. Calculated cost avoidance ranged from \$14,871 to \$194,819, with variation due to different cost estimation methods of adding costs incurred by the patient and/or institution. Projected revenue and cost avoidance totaled \$33,997 over three months. Providers working with the ACPs were satisfied with pharmacist care, interventions, documentation, and potential positive impact on patient access.

Conclusion: This project and evaluation studying the financial impact of the Ambulatory Care Pharmacist in primary care has contributed to the development of the pharmacist integration into primary care teams to provide CMM services within clinics studied in the Sacramento region. Three pharmacists providing CMM contributed positive financial outcomes, high provider satisfaction ratings, and potential impact on improving patient access. The initial positive results of this evaluation lends itself well to continued tracking, diffusion and establishment of ambulatory care pharmacy services within other regions of the Sutter Health system for additional quality and cost impact.

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Session-Board # - 4-017

Poster Title: Increasing operational efficiency and drug cost savings by partnering with a regional GPO and unit-dose packaging vendor

Poster Type: Evaluative Study

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: Collaboration with a regional group purchasing organization (GPO) and unit-dose repackaging vendor presents a new strategy for reducing drug purchasing costs and increasing operational efficiency. Through this type of collaboration, our unit-dose repackaging vendor could identify commercially available unit-dose oral solid and liquid products, with bulk alternatives, that could be repackaged into unit-dose at a significantly reduced cost. Bulk products repackaged in-house were also assessed. The purpose of this study was to identify key drugs that drive the greatest cost savings when purchased in bulk and repackaged with a unit-dose repackaging vendor for a three-hospital, 340-bed community health system.

Methods: The unit-dose repackaging vendor performed an analysis of the previous 12-month purchase history for all members of the regional GPO to identify the hospitals with the greatest opportunity for savings. The purchase history was categorized into two groups: Oral solids and oral liquids. A line-by-line analysis was completed to identify the total number of doses purchased and the corresponding cost of the commercially available unit-dose product. The unit-dose repackaging vendor then identified alternative bulk medications for those commercial unit-dose products. The cost-per-dose of the commercial unit-dose products was compared to the repackaged bulk products cost with the unit-dose vendor, including repackaging fees, to evaluate savings opportunities.

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Results: Utilizing the previous 12-month purchase history with a minimum of 500 doses or a savings of \$250 or greater, 192 products were identified by the unit-dose repackaging vendor. These purchases were a combination of GPO, 340B and Wholesale Acquisition Cost (WAC). The products identified demonstrated a total annual savings opportunity of \$264,180, including 14 liquid products with a total saving of \$19,760 and 178 oral solid products with a savings of \$244,420. The top seven liquid products produced 80 percent of the liquid savings, while 80 percent of the oral solid savings contained 50 products. The breakdown of the savings is as follows: GPO (37 percent), 340B (7 percent) and WAC (55 percent). The top 10 products with the greatest savings opportunity from each account type were identified; the savings consisted of \$124,429. These 30 products encompassed 45 percent of the total savings. Monthly par levels for these products were determined and the products were transitioned to be packaged with the unit-dose repackaging vendor. The remaining liquids and oral solids were assessed for further savings and ease of transition.

Conclusion: The strategic collaboration with a regional GPO and unit-dose repackaging vendor allowed our small community health system with three hospitals and 340 beds to uncover a significant reduction in drug costs. Additionally, increased operational efficiency may be realized by decreasing in-house labor around unit-dose repackaging. Based on the results of this analysis and the value seen in a collaborative strategy, sharing the cost savings and operational efficiency improvement strategy with other members of the hospital system may translate to additional significant cost savings across other institutional settings and practice types.

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Session-Board # - 4-018

Poster Title: Strategy to eliminate waste with metered dose inhalers (MDIs) in adult chronic obstructive pulmonary disease (COPD) patients in an acute care community hospital.

Poster Type: Descriptive Report

Submission Category: Administrative Practice/Management/Financial Management/Human Resources

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Purpose: The minimization of waste is an important aspect of good stewardship of the healthcare dollar. An ongoing issue noted in this 250 bed community hospital involved the disposal of partially used metered dose inhaler canisters. This project was designed to eliminate that waste while still providing effective respiratory care to the hospitalized chronic obstructive pulmonary disease (COPD) patient.

Methods: Metered dose inhaler canisters slated for disposal were sent back to the pharmacy to await destruction per the Environmental Protection Agency (EPA) guidelines regarding disposal of aerosol products. A pharmacist removed the sequestered canisters from the designated aerosol waste bin and evaluated each canister for the amount of remaining doses left in the canister. Of the 33 canisters evaluated, the average amount of medication remaining in the canisters was 90 percent. A strategy was developed by the pharmacist to convert each different inhaler stocked in inventory (29 in total) to a comparable nebulized solution. The Respiratory Therapy department leadership was apprised of the proposal and was in full support. The developed therapeutic interchange which used 6 different nebulized solutions was approved through the local Pharmacy and Therapeutics and Medical Executive Committees and initiated hospital-wide (with the exception of anesthesia) in October, 2017.

Results: Many positive trends have been noted since the implementation of the therapeutic interchange. The monthly average drug expenditure for respiratory products has decreased by 50 percent since implementation. Pre-conversion drug expenditures averaged \$14,000 per month and post-conversion drug costs have averaged \$7,000 per month. Respiratory supply

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costs have decreased due to the elimination of the required inhaler spacer (\$4.67) previously used. The need for aerosol canister disposal has been eliminated. A 14 percent decrease in the average length of stay (LOS) for the COPD patient has been noted since the implementation. The use of the conversion eliminated concerns for potential cross-contamination and infection control issues noted with the use of the common canister. Respiratory staff satisfaction has increased because they no longer experience lost inhalers and having to requisition new ones. Pharmacy staff satisfaction has increased because they no longer have to add auxiliary barcodes to products or replace lost inhalers. Barcode scanning compliance and accurate billing has been impacted by the use of individually wrapped, manufacturer barcoded, unit-of-use nebulizer solutions. There have been no reports of negative outcomes or ineffective respiratory therapy treatments on the patients with the nebulized treatments.

Conclusion: The metered dose inhaler to nebulizer therapeutic interchange has proven to have many positive outcomes. This interchange has been adopted as part of the COPD clinical care redesign for a large multi-hospital regional healthcare system and is in the process of being initiated at other campuses throughout this healthcare system.

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Session-Board # - 4-019

Poster Title: Sacubitril/valsartan coverage and Medicare Part D beneficiaries; the early years

Poster Type: Descriptive Report

Submission Category: Cardiology / Anticoagulation

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Purpose: Heart failure with reduced left-ventricular (LV) ejection fraction (HFrEF) is common among Medicare D beneficiaries (40%), carrying higher risks of HF related admission, HF worsening, 30-day readmission and cardiovascular mortality. The 2017 focused updates to the 2013 ACCF/AHA heart failure guidelines recommended sacubitril/valsartan as a class I BR alternative or replacement for ACEI's/ARB's in HFrEF patients. The implications are for greatly improved outcomes, even at a cost of \$6,672/yearly (June 2018). We undertook a review of Medicare-D drug-related spending to determine if sacubitril/valsartan was prescribed to beneficiaries with HFrEF.

Methods: 2011-2016 Medicare-D drug related spending data from CMS was evaluated to determine total claims, spending and dosage units of sacubitril/valsartan received by beneficiaries.

Results: Sacubitril/valsartan became available to prescribers and beneficiaries in July of 2015 allowing for 803 claims and 45,677 total dosage units with an average spending per claim of \$360.40 and \$6.34 per dosage unit (\$12.68/day). During 2015, 134 patients could have received up to 6 full months of therapy (July to December 2015). The total number of claims and total dosage units in 2016 were 19,426 and 1,142,986 with an average spending per claim of \$388 and \$6.60 per dosage unit (\$13.20). During 2016, 1,619 patients could have received up to 12 full months of therapy.

Conclusion: Even without patient-level data, aggregate spending data show fewer than 3% of eligible HFrEF patients received sacubitril/valsartan in the Medicare-D pool, early in the prescribing life-cycle. Failure to identify patients with HFrEF early (preferably in primary care)

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and maximize medical therapy including sacubitril/valsartan will contribute to the progressive increase in new HF related diagnoses, HF related morbidity and mortality.

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Session-Board # - 4-020

Poster Title: Does body mass index (BMI) influence warfarin dosing requirements? a retrospective cross-sectional study from Qatar

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Qatar has some of the highest rates of metabolic disorders (including obesity) within the region. A recent report indicated that more than 70 percent of Qatar's population is either overweight or obese. Evidence supporting the effect of body mass index (BMI) on maintenance warfarin doses and anticoagulation control is contradicting.

The purpose of this study was to investigate whether a correlation exists between BMI and weekly warfarin dose required to maintain a stable therapeutic INR and whether an individual's BMI could affect anticoagulation control reflected by mean time in therapeutic range (TTR) and the incidence of thromboembolic and/or bleeding events.

Methods: A retrospective cross sectional study of adult patients (>18 years old) receiving stable doses of warfarin, defined as having a therapeutic INR without a change in warfarin dose for at least 6 weeks, and attending ambulatory anticoagulation clinic in Hamad General Hospital, a tertiary teaching hospital in Qatar, over one year period (July 1st 2016 - June 30th 2017). Patients with missing data (demographics, target INR), those known to have poor compliance to warfarin and/or clinic visits or those who lost follow up with the clinic were excluded. Relevant data were collected through electronic chart review. These include, patients' demographics, indication and duration of warfarin therapy, target INR, comorbidities (e.g., diabetes, hypertension, renal and hepatic dysfunction), tobacco use, the presence of drugs known to significantly interact with warfarin as well as any reported incidents of bleeding (along with type/severity of the bleeding) and thrombosis were collected. TTR was calculated using Rosendaal method.

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BMI, the independent variable, was analyzed as a continuous and categorical variable (six BMI categories: underweight, normal weight, overweight, obese, morbidly, and severely obese) and was then correlated with warfarin dose (weekly and mg/kg) accordingly.

Results: A total of 159 patients were included (57.9% males). The BMI ranged between 14.3 – 61.8 kg/m² (median 30.56 kg/m²) and the mean TTR ($\pm$ standard deviation) was 78 ($\pm$ 18.2). Overall, there was a weak positive correlation between BMI and weekly warfarin maintenance dose (Pearson's r 0.186, $P=0.019$).

When comparing mean TTR across different BMI categories, no differences were observed (P -value =0.61).

There was, however, a weak negative correlation between BMI and weekly mg/kg warfarin dose (Pearson's r -0.22). When compared to normal BMI, morbid and severely obese patients had lower weekly mg/kg warfarin doses requirements (P -value of 0.037 and 0.028 respectively). Among 159 patients, no thrombotic events were detected. Thirteen incidents of minor bleeding were reported with insignificant differences observed across different BMI categories ($P=0.62$).

Conclusion: A weak positive correlation exists between BMI and total weekly warfarin dose. No correlation was observed between BMI and anticoagulation control.

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Session-Board # - 4-021

Poster Title: Clinical pharmacist interventions in the management of hospitalized patients on warfarin

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Warfarin is widely prescribed oral anticoagulant that poses high risks of hemorrhage as well as thromboembolism due to its narrow therapeutic index, and interactions with other medications and foods. International Normalized Ratio (INR) levels require a close monitoring to achieve and maintain Time in Therapeutic Range (TTR) which is considered the marker of the quality, efficacy, and safety of the treatment of patients on warfarin. The purpose of this study is to assess the influence of clinical pharmacist interventions in the management of hospitalized patients on warfarin and to evaluate the causes of elevated INR levels.

Methods: Upon the approval of the institutional review board, and an informed consent was obtained from all participants, a prospective, randomized, controlled study was conducted for six months at a tertiary care teaching hospital in Bangalore, India. Participants who met the inclusion criteria were divided by a simple randomization technique into two groups, an intervention group consisted of 63 patients (n equals 63) and a controlled group of 60 patients (n equals 60). Primary outcome measure was time in therapeutic range (TTR) by the fraction of INRs in the range method which was calculated by taking total number of INRs within therapeutic range for all patients divided by the total number of INRs checked during the study period. Secondary outcome measures included possible causes of increased INR levels, and bleeding and thromboembolic events. All relevant data were collected from patient medical records, and clinical notes including indications for the use of warfarin. For the intervention group, follow-ups were done on a daily basis by clinical pharmacist to analyze suspected warfarin drug and food interactions, monitor INR values and associated risks, recommend dose

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changes, and lifestyle cautions, and interventions were made accordingly. The collected data for both intervention and the controlled groups was compared for the assessment of the quality, efficacy, and safety during the hospitalization period.

Results: A total patients of 123, the indications for warfarin in both groups were Atrial Fibrillation 66 patients (53.65 percent), Deep Vein Thrombosis 39 patients (31.7 percent), and Pulmonary Embolism 18 patients (14.63 percent). In the intervention group, the TTR of the international normalized ratio results were within the therapeutic range (57.87 percent), supra-therapeutic (20.25 percent), sub-therapeutic (9.64 percent), and greater than 5 (0.32 percent). Whereas in the controlled group, TTR within the therapeutic range (43.27 percent), supra-therapeutic (34.54 percent), sub-therapeutic (14.18 percent), and greater than 5 (2.9 percent). Elevated levels of INR were found in both groups, the intervention group had 6 incidents (9.52 percent) of increased INR levels due to warfarin interactions (3 with azithromycin, 2 with heparin, and 1 with atorvastatin). However, in the controlled group 18 patients (30 percent) experienced elevated INR levels due to warfarin interactions (7 with azithromycin, 4 with heparin, and 3 with fluconazole). And 2 due incorrect renal dosage adjustment, 1 due to warfarin food interaction, and 1 suspected adverse drug reaction of warfarin which lead to Hematoma.

Conclusion: Time within therapeutic range (TTR) was higher in the intervention group. Prevention of many drug reactions, clinical pharmacist role can be crucial in the optimization of warfarin therapy and obtain better patient clinical outcomes by maximizing treatment effectiveness and minimize complications. The safety of the warfarin therapy was ensured by Implement the clinical pharmacist intervention in the management of patients on Warfarin.

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Session-Board # - 4-022

Poster Title: Anticoagulant therapy utilization pathways in patients with recent venous thromboembolism

Poster Type: Descriptive Report

Submission Category: Cardiology / Anticoagulation

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Purpose: Warfarin has been the mainstay of venous thromboembolism (VTE) treatment since its introduction in 1954. Due to difficulties associated with warfarin therapy, the direct oral anticoagulants (DOACs) have been introduced to the market. Studies have shown that DOACs are safe and either more effective or non-inferior to warfarin in VTE treatment. The purpose of this study is to describe the most common self-reported anticoagulant therapy utilization patterns in a national cohort of patients with recent VTE who received therapy during the following phases of VTE treatment: initial (first 7 days), long-term (8 to 90 days) or extended (90+ days)

Methods: A descriptive study was conducted using data from a national online survey administered to 907 patients 18 years of age or older who experienced VTE event in the last two years. Participants were invited to complete the survey which took approximately 45 minutes to complete. Participants diagnosed with cancer within the past 2 years were excluded given the additional treatment complexity of cancer-related VTE events. Patients were asked about their experiences as they transitioned from the healthcare system to home following VTE diagnosis. Anticoagulants included low-molecular-weight heparin (i.e., enoxaparin, dalteparin), fondaparinux, unfractionated heparin, warfarin, and/or DOACs (i.e., rivaroxaban, apixaban, edoxaban and dabigatran). Data were summarized using basic descriptive statistics.

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Results: The mean (SD) age of respondents was 52.4 (14.4) years and 56.7 percent were women. The most recent VTE episode was deep vein thrombosis (DVT) in 63.8 percent, pulmonary embolism (PE) in 18.1 percent, and both DVT and PE in 18.1 percent. We identified the following predominant patterns: Injectable only, aspirin only, warfarin, DOACs, patients who switched between warfarin and DOACs, patients who switched between different DOACs, and no treatment. Overall, 39 percent of patients received warfarin-based treatment, 26 percent received DOACs, 4 percent received injectable only and 9 percent received aspirin only. There were 13 percent patients who switched between warfarin and DOACs, 5 percent who switched between DOACs and 5 percent reported no treatments. The proportion of patients receiving injectable therapy during the initial phase of treatment was 39.1 percent declining to 5.2 percent and 1.5 percent during 8-90 and 90+ days, respectively. During the initial phase of treatment 48.4 percent of warfarin patients also received injectable anticoagulants, compared to 38.1 percent of DOAC patients. There were 65.7 percent patients who received extended anticoagulant therapy beyond 90 days. Aspirin coadministration with anticoagulant therapy ranged from 22.9 percent (warfarin patients) to 51.4 percent (patients switching between warfarin and DOACs).

Conclusion: In this national sample of recent VTE sufferers warfarin therapy remains the predominant medication pathway in VTE treatment followed by DOAC therapy. Switching between anticoagulant therapy options was common although the reasons for switching was not collected. Use of injectable anticoagulants was common during the first 7 days of therapy, even among patients receiving DOACs. Aspirin coadministration with anticoagulant therapy was common and may present an intervention opportunity for pharmacists. These medication utilization pathways will be useful for other studies using these survey results examining

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Session-Board # - 4-023

Poster Title: Comparison of two weight caps in an anti-Xa based heparin protocol

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Although weight-based heparin nomograms have been in use for more than 20 years, there is little data evaluating the safety and efficacy of these nomograms in obese patients. Many protocols include a weight or dose cap, but there is no accepted standard. At a large, tertiary care hospital, an 85 kg weight cap was instituted for the Raschke-based protocol using the results from an internal regression analysis. As part of protocol standardization across a health system, this weight cap was changed to 110 kg. An evaluation was undertaken to determine if the new cap was appropriate.

Methods: A list of patients receiving a heparin infusion after implementation of the 110 kg weight cap was obtained from the electronic health record. All patients receiving a standard protocol infusion (80 units/kg bolus, followed by 18 units/kg/hr with a goal anti-Xa of 0.3-0.7) during a 2 week period following the implementation were included. Information was collected on the indication, actual weight, dosing weight, use of boluses, anti-Xa levels, bleeding complications, and the formation or extension of clotting. Patients were excluded if the protocol was not followed, for insufficient or missing data, if the heparin drip was not started or discontinued prior to the first anti-Xa level, if the patient was switched to from another protocol, or if the patient was on a direct oral anticoagulant prior to initiating heparin. These results were compared to historical data collected in a similar fashion prior to the institution of the new protocol. The historical data used an 85 kg weight cap.

Results: For the 110 kg weight cap analysis, a total of 116 patients were identified with 94 included. The average weight for the included patients was 91 kg (range 45 – 153.5 kg). Fifty-four percent of patients were less than 85 kg, with 25% of patients between 85 and 110 kg, and 21% were greater than 110 kg. The distribution of initial anti-Xa levels varied between the three weight groups, with increasing rates of supratherapeutic levels as the weight increased.

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For patients less than 85 kg, the percentage of patients with subtherapeutic, therapeutic, and supratherapeutic levels were 22%, 56%, and 22%, respectively. These percentages changed to 26%, 32%, and 42% for patients 85-110 kg and 0%, 38%, and 63% for patients greater than 110 kg. No complications attributed to heparin were noted during the evaluation period.

This data was compared to an evaluation of the previous 85 kg weight cap. In that evaluation, conducted in a similar manner, 55 patients receiving the standard protocol were included in the analysis. Approximately half of the patients were less than 85 kg and half were greater than 85 kg. The rates of therapeutic levels were similar across both weight groups.

Conclusion: At this large, tertiary care hospital, the use of a 110 kg weight cap for a heparin protocol led to higher rates of supratherapeutic levels in obese patients and became more skewed as weights increased. These trends were not seen in an analysis of the previous 85 kg weight cap, indicating that the 85 kg weight cap is more appropriate for obese patients.

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Session-Board # - 4-024

Poster Title: Body mass index and outcomes of dual antithrombotic therapy with dabigatran and a P2Y12 inhibitor in atrial fibrillation patients undergoing percutaneous coronary intervention: RE-DUAL PCI

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Knowledge about efficacy or safety of non-vitamin K antagonist oral anticoagulants (NOACs) in patients with extremes of body weight or body mass index (BMI, including patients with BMI less than or equal to 25 or greater than or equal to 35) is generally lacking. This information may impact drug levels, and could be of even greater relevance when a NOAC is combined with an antiplatelet agent. RE-DUAL PCI (NCT02164864) evaluated the safety and efficacy of dabigatran dual therapy with a P2Y12 inhibitor vs. a classical warfarin “triple therapy.” Here, the impact of BMI on outcomes in RE-DUAL PCI is assessed.

Methods: The RE-DUAL PCI trial randomized 2725 patients with nonvalvular atrial fibrillation who had undergone percutaneous coronary intervention (PCI) to triple therapy with warfarin, clopidogrel or ticagrelor, and aspirin for 1 to 3 months, or to dabigatran dual therapy with either 110 mg or 150 mg twice daily (BID), each with either clopidogrel or ticagrelor. We report the rates of the first International Society on Thrombosis and Haemostasis (ISTH) major bleeding events or clinically relevant non-major bleeding events, and the composite end point of death, myocardial infarction, stroke, systemic embolism, or unplanned revascularization, as a function of baseline BMI, dividing the population into four subgroups of BMI (all in kg/m² body surface area): normal/underweight (less than 25), overweight (25 to less than 30), class I obese (30 to less than 35) and greater than class I obese (greater than or equal to 35). Written

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informed consent was obtained from all the patients and the RE-DUAL PCI trial was approved by an Institution Review Board.

Results: Median (range) BMI was 28.1 (14-66). The study included 618 patients with BMI less than or equal to 25; 1113 patients with BMI of 25 to less than 30; 664 patients with BMI of 30 to less than 35 and 326 patients with BMI greater than or equal to 35. Dual therapy demonstrated significantly lower rates of bleeding irrespective of baseline BMI for dabigatran 110 mg (BMI less than 25, hazard ratio[95 percent CI] equals 0.59 [0.42-0.83]; BMI 25 to less than 30, hazard ratio[95 percent CI] equals 0.54 [0.39-0.74]; BMI 30 to less than 35, hazard ratio[95 percent CI] equals 0.46 [0.28-0.75]; and BMI greater than or equal to 35, hazard ratio[95 percent CI] equals 0.38 [0.19-0.77]) and dabigatran 150 mg (BMI less than 25, hazard ratio[95 percent CI] equals 0.70 [0.46-1.06]; BMI 25 to less than 30, hazard ratio[95 percent CI] equals 0.83 [0.61-1.15]; BMI 30 to less than 35, hazard ratio[95 percent CI] equals 0.67 [0.41-1.09]; and BMI greater than or equal to 35, hazard ratio[95 percent CI] equals 0.51 [0.27-0.96] vs warfarin triple therapy. Thromboembolic event rates did not differ between the two groups by BMI (p value for interaction was nonsignificant).

Conclusion: The benefit of the dabigatran dual therapy vs warfarin triple therapy in patients with atrial fibrillation after percutaneous coronary intervention was consistent regardless of body mass index, including a substantial number of overweight and obese patients.

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Session-Board # - 4-025

Poster Title: Effective reversal of dabigatran anticoagulation by idarucizumab in patients with renal impairment

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Idarucizumab is licensed for dabigatran reversal based on the results of the RE-VERSE AD study, which showed rapid and complete reversal of dabigatran-associated anticoagulation in patients presenting with severe bleeding, or in those requiring urgent surgery. Like dabigatran, idarucizumab is cleared primarily by the kidneys. Therefore, idarucizumab and dabigatran may accumulate in patients with renal impairment, which could compromise dabigatran reversal. To examine this possibility, we compared the extent of dabigatran reversal in patients with and without renal impairment in the RE-VERSE AD study.

Methods: RE-VERSE AD was a multicenter, prospective open-label study in which dabigatran-treated patients with uncontrollable or life-threatening bleeding or those requiring urgent invasive procedure were given 5 grams of intravenous idarucizumab for reversal of dabigatran anticoagulation (1). The study protocol was approved by all the relevant institutional review boards, and all patients provided written informed consent. The primary endpoint was maximum reversal of dabigatran anticoagulation in the first 4 hours after idarucizumab administration as measured by the ecarin clotting time or diluted thrombin time. Patients were divided into groups with normal renal function defined by an estimated creatinine clearance (CrCl, calculated with the use of the Cockcroft–Gault equation) of 80 mL per minute or higher, or mild, moderate, or severe renal impairment defined by estimated CrCl values of greater than or equal to 50 mL per minute to less than 80 mL per minute, greater than or equal to 30 mL per minute to less than 50 mL per minute, and less than 30 mL per minute, respectively.

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Results: At baseline, 21.5 percent (n, 108; median age, 68 years) of patients had normal renal function (CrCl 110.1 mL per minute); 18.1 percent (n, 91; median age, 82 years), 25.2 percent (n, 127; median age, 82 years), and 32.4 percent (n, 163; median age, 78 years) of patients had severe (CrCl 20.4 mL per minute), moderate (CrCl 40.2 mL per minute) or mild (CrCl 61.7 mL per minute) renal impairment, respectively. The median time since the reported last dose of dabigatran administration was 14.3 hours in patients with normal renal function, and 19.3, 15.9 and 15.0 hours in patients with severe, moderate and mild renal impairment, respectively. In patients with normal renal function, the median dabigatran concentration was 46.8 ng per mL whereas in patients with severe, moderate and mild renal impairment, the median dabigatran concentrations were 231, 127.5 and 69.3 ng per mL, respectively. Overall, 12.1, 2.4 and 0.6 percent of patients with severe, moderate and mild renal impairment, respectively, had median dabigatran concentrations greater than 1000 ng per mL. The median maximum percentage reversal was 100 percent (95 percent confidence interval, 100 to 100) in patients with normal as well as impaired renal function.

Conclusion: Although median dabigatran levels increased in a concentration-dependent manner with declining renal function, idarucizumab appears to effectively reverse dabigatran-mediated anticoagulation regardless of patients' renal function at baseline.

Reference:

- (1) Pollack CV, Reilly PA, van Ryn J et al. Idarucizumab for dabigatran reversal - full cohort analysis. N Engl J Med. 2017 Aug; 377(5):431-41.

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Session-Board # - 4-026

Poster Title: Impact of direct oral factor-Xa inhibitors on therapeutic unfractionated heparin monitoring in an anti-factor Xa based protocol

Poster Type: Descriptive Report

Submission Category: Cardiology / Anticoagulation

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Purpose: Recent literature suggests that direct oral factor-Xa inhibitors may impact both the partial thromboplastin time (PTT) and anti-factor Xa (anti-Xa) levels. Apixaban, edoxaban, and rivaroxaban are direct oral factor-Xa inhibitors that impact the validity of the anti-Xa level when calibrated with unfractionated heparin (UFH). Anti-Xa based protocols to maintain therapeutic UFH therapy, were recently implemented across three community hospitals. Due to variable results with anti-Xa level monitoring, a drug use evaluation (DUE) will further define the frequency of patients receiving direct factor-Xa inhibitors and transitioning to UFH infusions, as well as the duration of effect their on the anti-Xa level.

Methods: A DUE was performed including patients admitted to the hospital from March 19th, 2018 through June 14, 2018, after implementation of an anti-Xa monitoring protocol. Patients were included if they received a dose of apixaban, edoxaban, or rivaroxaban and were subsequently started on a continuous UFH infusion. Patients receiving UFH infusions were monitored with both PTT and anti-Xa levels to assess the relationship between oral factor-Xa inhibitors and anti-Xa testing which had been calibrated with UFH.

Results: Out of 206 patients that were started a continuous UFH infusion, nine patients had recent administration of an oral factor-Xa inhibitor (4.4 percent). At baseline and six hours into the infusion, all nine patients exhibited supratherapeutic anti-Xa activity, while corresponding PTT results indicated subtherapeutic values. Approximately 22 percent of patients exhibited a

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therapeutic PTT result on the second PTT and 57% by the third PTT, whereas the corresponding anti-Xa levels were consistently supratherapeutic. Therapeutic PTT levels were defined as 67 to 81 seconds for acute coronary syndrome (ACS) and 67 to 95 seconds for atrial fibrillation and venous thromboembolism (VTE). The average time from last recorded oral factor-Xa dose to an interpretable anti-factor Xa level was 49.9 hours.

Conclusion: Direct oral factor-Xa inhibitors impact anti-Xa levels that are calibrated to UFH. Patients who start an UFH infusion with a recent history of oral factor-Xa inhibitor administration should be monitored with a PTT for an average of two days before relying solely on anti-Xa levels. Further evaluation, including a greater sample size would be beneficial to assess additional factors impacting the relationship between direct factor-Xa inhibitors and the anti-Xa level, such as renal function, age, and dose of direct oral factor-Xa.

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Session-Board # - 4-027

Poster Title: Impact of renal function on dual antithrombotic therapy with dabigatran in patients with atrial fibrillation undergoing percutaneous coronary intervention: RE-DUAL PCI

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Christopher P Cannon

Purpose: In patients with atrial fibrillation undergoing antithrombotic treatment, achieving a balance between the prevention of thrombosis and increased bleeding risk is critical. Dabigatran, an oral direct thrombin inhibitor, provides an alternative to warfarin for anticoagulation therapy. The RE-DUAL PCI trial evaluated the safety and efficacy of dabigatran dual therapy vs. warfarin triple therapy. As approximately 85 percent of dabigatran is renally excreted, renal function as assessed by creatinine clearance could influence treatment effects of dabigatran. Here, we determine the impact of renal function on the outcomes of dual antithrombotic therapy with dabigatran and a P2Y12 inhibitor in a clinical setting.

Methods: The RE-DUAL PCI trial (NCT02164864) randomized 2725 patients with atrial fibrillation who had undergone percutaneous coronary intervention (PCI) to warfarin triple therapy with clopidogrel or ticagrelor and aspirin for 1 to 3 months, or to dabigatran dual therapy (110 mg or 150 mg twice daily) with clopidogrel or ticagrelor. We report the rates of the primary outcome, first International Society on Thrombosis and Haemostasis (ISTH) major bleeding or clinically relevant non-major bleeding event, and the secondary thrombotic end point of death, myocardial infarction, stroke, systemic embolism or unplanned revascularization, by baseline creatinine clearance (less than 30 ml/min; 30 to less than 50 ml/min; 50 to less than 80 ml/min; greater than or equal to 80 ml/min). The study was approved by the Institutional Review Board and all the patients provided written informed consent.

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Results: Mean (standard deviation) baseline creatinine clearance was 78.0 (29.76) ml/min. Dabigatran 110 mg dual vs. warfarin triple therapy had lower rates of bleeding across all levels of creatinine clearance. Bleeding was lower with dabigatran 150 mg dual therapy with creatinine clearance of 50 to less than 80 ml/min (hazard ratio equals 0.69; 95 percent confidence interval equals 0.49-0.97) and with creatinine clearance greater than or equal to 80 ml/ml (hazard ratio equals 0.59; 95 percent confidence interval equals 0.43-0.83); it was similar at creatinine clearance 30 to less than 50 ml/min (hazard ratio equals 1.04; 95 percent confidence interval equals 0.55-1.97); p value of interaction was non-significant (0.34). Thromboembolic event rates were similar between groups by creatinine clearance.

Conclusion: The benefit on bleeding reduction of dabigatran 110 mg dual vs. warfarin triple therapy in patients with atrial fibrillation undergoing percutaneous coronary intervention was consistent regardless of baseline creatinine clearance. For dabigatran 150 mg dual therapy, bleeding was reduced vs. warfarin triple therapy in patients with baseline creatinine clearance more than 50 ml/min and similar in patients with creatinine clearance 30 to less than 50 ml/min.

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Session-Board # - 4-028

Poster Title: Dual antithrombotic therapy with dabigatran versus triple therapy with warfarin after percutaneous coronary intervention in patients with atrial fibrillation and diabetes mellitus

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Patients with diabetes and coronary artery disease have a higher risk of major adverse cardiac and cerebral events than patients without diabetes. In the RE-DUAL PCI trial, dabigatran dual antithrombotic therapy reduced bleeding events, without increasing the risk of thromboembolic events, when compared to warfarin triple antithrombotic therapy. This subgroup analysis evaluated the effects of treatment on thromboembolic and bleeding risks in patients with and without diabetes, separately, in order to assess if patients with diabetes and atrial fibrillation (AF) undergoing percutaneous coronary intervention (PCI) are adequately protected against thromboembolic events by dual versus triple antithrombotic therapy.

Methods: In RE-DUAL PCI, 2725 AF patients who had undergone PCI were assigned to triple therapy (warfarin, clopidogrel or ticagrelor and aspirin; W-TAT) or dual therapy (dabigatran 110 mg or 150 mg bid, plus clopidogrel or ticagrelor; D110- and D150-DAT). In this subgroup analysis, we report outcomes in patients with diabetes (D110-DAT, n equals 362 vs W-TAT, n equals 371; D150-DAT, n equals 260 vs W-TAT, n equals 303) as well as in patients without diabetes (D110-DAT, n equals 619 vs W-TAT, n equals 609; D150-DAT, n equals 503 vs W-TAT, n equals 460). The thromboembolic endpoint was a composite efficacy endpoint of death, thromboembolic events (myocardial infarction, stroke, or systemic embolism), or unplanned revascularization and the bleeding endpoint was a composite of major or clinically relevant non-major bleeding events as defined by the International Society on Thrombosis and

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Haemostasis during follow-up (mean follow-up, 14 months). For comparison with D150 DAT, elderly patients from W-TAT group outside US were excluded from the analysis. Informed consent was obtained from all patients included in RE-DUAL PCI studies.

Results: In patients with diabetes, the incidence of bleeding was 15.2 percent in the D110-DAT group versus 27.5 percent in the W-TAT group (55 vs 102 events; hazard ratio [HR] 0.48; 95 percent confidence interval [CI], 0.35-0.67), and 23.8 percent in the D150-DAT group compared with 25.1 percent in the W-TAT group (62 vs 76 events; HR 0.87; 95 percent CI, 0.62-1.22). The incidence of the composite efficacy endpoint in patients with diabetes was 16.1 percent in the D110- and D150-DAT groups combined compared with 15.1 percent in the W-TAT group (100 vs 56 events; HR 1.04; 95 percent CI, 0.75-1.45), whereas it was 12.4 percent in the D110- and D150-DAT groups combined compared with 12.3 percent in the W-TAT group (139 vs 75 events; HR 1.05; 95 percent CI 0.79-1.39) in patients without diabetes. No significant interaction was observed between the treatment and diabetes subgroup, for neither the bleeding nor the composite efficacy endpoints.

Conclusion: Patients with diabetes and atrial fibrillation were at greater risk for thromboembolic events but not bleeding after percutaneous coronary intervention. In patients with diabetes, the risk of bleeding was substantially reduced with D110-DAT but the risk reduction seemed less pronounced with D150-DAT versus W-TAT. Among patients with diabetes, D110-DAT and D150-DAT combined had similar rates of overall thrombotic events compared with W-TAT.

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Session-Board # - 4-029

Poster Title: Analysis of cost-effectiveness of betrixaban compared with enoxaparin for prophylaxis of venous thromboembolism in nonsurgical patients with acute medical illness in the United States

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Venous thromboembolism (VTE) in hospitalized acute medically ill patients is a leading preventable cause of morbidity and mortality. Studies show that VTE risk continues following discharge in nonsurgical acutely ill patients receiving short-duration VTE prophylaxis. The efficacy/safety of betrixaban for extended VTE prophylaxis was investigated versus standard enoxaparin prophylaxis in the Phase 3 APEX study. Based on the results, betrixaban was FDA-approved for extended VTE prophylaxis in acutely medically ill adults at risk of VTE. This analysis estimated the cost-effectiveness of betrixaban versus enoxaparin in adult nonsurgical patients with acute medical illness who require VTE prophylaxis in the US.

Methods: A cost-effectiveness analysis was conducted to estimate the cost per quality-adjusted life-year (QALY) gained for betrixaban (35-42 days) compared to standard-duration enoxaparin (6-14 days) from a US payer perspective over a lifetime horizon. In the first three months, a decision tree structure was used to estimate primary events and treatment complications (TCs) based on primary and secondary efficacy and safety data from the APEX study. The decision tree structure included primary events and TCs (VTE, myocardial infarction, ischemic stroke, death, bleeding and thrombocytopenia). After the first three months, patients entered a six-health state Markov model and were at risk of recurrent events and long term complications. Costs captured the treatment and management of primary events, TCs, recurrent events and primary event complications. Published literature identified the risk of recurrent events and

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long term complications, EQ-5D utility data and costs. A 3% discount rate per annum was used. Uncertainty was explored through deterministic and probabilistic sensitivity analysis.

Results: In the base case analysis, betrixaban dominated enoxaparin, leading to cost savings of \$780 and increased QALYs of 0.017 per patient. The corresponding probabilistic analysis showed that VTE prophylaxis with betrixaban led to a saving of \$790 and a gain of 0.017 QALYs per patient. Furthermore, all sensitivity analyses maintained the result of betrixaban dominating enoxaparin.

Conclusion: In this analysis, betrixaban demonstrated potential cost savings and effectiveness over enoxaparin. Due to cost savings per patient and unmet need, betrixaban can be considered a cost-effective treatment for adult nonsurgical patients with acute medical illness at risk of VTE, who require extended VTE prophylaxis from hospitalization through post-discharge.

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Session-Board # - 4-030

Poster Title: Risk of cardiovascular events in patients with rheumatoid arthritis in a Texas population

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Rheumatoid arthritis (RA) is the most common chronic inflammatory arthritis in the United States. Among patients with RA, the risk of having a myocardial infarction rises by 60 percent within one to four years after RA diagnosis. Over 50 percent of premature deaths in RA are attributable to cardiovascular (CV) disease. Despite remarkable strides in RA treatment, mortality remains high largely due to CV complications from the disease. Few studies adequately characterize CV event risk in the RA population. The purpose of this study is to identify factors associated with CV event risk in RA patients within a Texas population

Methods: We conducted a retrospective cohort study was using pharmacy and medical claims and electronic medical record data from July 1, 2010 through March 31, 2018. RA patients at least 18 years if age with continuous enrollment at least 6 months prior to and after first RA diagnosis (index date) were included in the study. Patients were placed into two separate cohorts: an RA cohort without a CV event post-index and a RA cohort with a CV event post index. For post-index comparisons, ordinary least squares regression was used to determine associations between CV events and predictors – age, gender, comorbidity, RA medication use, oral and injectable glucocorticoid use, and opioid use. Kaplan-Meier and Cox Proportional Hazards survival curves were constructed for time from RA diagnosis to CV event or censorship.

Results: A total of 727 patients were included in the study; 586 patients met inclusion for our RA cohort without CV event post-index and 141 patients met inclusion for our RA cohort with CV event post-index. Significant differences were observed in some baseline demographic or

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clinical characteristics. Patients in our RA cohort with a CV event post index were older compared to those without a CV event with a mean(SD) age of 70(10) years versus 54(13) years (p less than 0.0001). In addition, our RA cohort with a CV event post-index date had higher average(SD) Charlson Comorbidity Index scores than those without a CV event (0.9[1.4] versus 0.3[0.9]; p less than 0.0001). RA patients not on anti-tumor necrosis factors (anti-TNFs) generally had higher CV event risk compared to those on anti-TNFs (p equals 0.0228). RA patients on anti-TNFs had a 43 percent decrease in hazard rate compared to those not on anti-TNFs (HR equals 0.573; 95% CI: 0.330- 0.997; p equal to 0.0488).

Conclusion: Our study showed that methotrexate and anti-TNFs in RA patients were associated with decreased CV event risk. Anti-TNF use was also associated with a longer time to CV event from RA diagnosis compared to no anti-TNF use.

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Session-Board # - 4-031

Poster Title: Understanding patient's access to care barriers in the treatment of venous thromboembolism

Poster Type: Descriptive Report

Submission Category: Cardiology / Anticoagulation

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Purpose: Venous thromboembolism (VTE), including deep vein thrombosis or pulmonary embolism, is a common disease associated with increased mortality, high recurrence rates, and substantial health-care costs. There are many factors that may affect a patient's perceptions of their access to VTE care, both positively and negatively. Presently, there is limited understanding regarding how these variables and barriers affect VTE patient care. Therefore, the purpose of this study is to characterize patient's perceptions of barriers encountered during VTE treatment.

Methods: A national online survey was administered to 907 adult respondents who had experienced a VTE event in the past two years. Respondents with cancer were excluded. The survey assessed perceptions of VTE care barriers by 4 questions: 1) How difficult is it for you to meet healthcare costs related to your VTE care? 2) How difficult is for you to meet costs for your VTE prescription medications? 3) How difficult do transportation issues make it for you to get your VTE care? 4) To what degree do you need the support of others at home to get your VTE care you need? Questions 1-3 (4) were evaluated by a 1-to-10 scale where "1" means "Not at All Difficult" and "10" means "Extremely Difficult". Question 4 was evaluated where "1" means "Not at All Needed" and "10" means "Extremely Needed". Each question was correlated with patient demographics including income level, place of residence, current work status, and health insurance; care related patient harms experienced with the VTE episode; number of

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lifetime VTE events; patient beliefs concerning VTE outcomes, and oral anticoagulant therapy pathways. Statistical analysis was conducted with SAS v 9.4 (Cary, NC). Likert scale items were considered continuous variables for analysis. Linear regression was used to determine the effect of the independent predictors on the outcome variables. Significance was set at p-value less than 0.05.

Results: Respondents had a mean age of 52.4 years (14.4 SD). The majority were women (56.7%). The sample was predominantly Caucasian (88.6%) with representation of those of Hispanic ethnicity (10.6%) and African-American race (6.8%). Most were living in the urban community setting, had health insurance, and an income level between; \$50,000 to \$99,000. Most reported VTE events were DVT (63.8%). A single lifetime VTE event was experienced by 35.4% and 2 or more by 64.6%. Respondents rated meeting healthcare costs and meeting VTE prescription medication costs mildly difficult (Health Care Costs: Not Difficult at All: 61%, Extremely Difficult: 9% and VTE Prescription Medication Costs: Not Difficult at All: 74%, Extremely Difficult: 8%). Transportation issues and home support were rated not difficult at all (Transportation Issues: Not Difficult at All: 87%, Extremely Difficult: 5% and Home Support: Not Difficult at All: 87%, Extremely Difficult: 5%). Meeting healthcare costs was correlated with difficulty with VTE medication costs and experiencing transportation issues. Difficulty with transportation issues correlated with satisfaction with VTE care, relationship with their primary healthcare primary provider's office, and home support. However, home support only correlated with transportation issues.

Conclusion: Respondents in a large national online survey who had suffered a VTE event in the past two years found healthcare costs and VTE medication costs mildly difficult to meet. They rated transportation and home support as not being a barrier to VTE care. Barriers to VTE care in the U.S. affect approximately 0.5-1 in 10 persons with prior VTE event in the U.S.

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Session-Board # - 4-032

Poster Title: Evaluating the dose of heparin in acute limb ischemia

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Heparin is used at higher doses for venous clots, such as a venous thromboembolism, than arterial clots, such as a myocardial infarction. Acute Limb Ischemia is an arterial clot where higher doses of heparin are sometimes utilized. High dose heparin (typically 80 units per kilogram then 18 units per kilogram per hour) is thought to achieve therapeutic levels quicker than low dose heparin (typically 60 units per kilogram then 12 units per kilogram per hour). The purpose of this study is to determine if high dose heparin achieves better therapeutic outcomes than low dose heparin in acute limb ischemia.

Methods: The institutional review board approved this single center retrospective cohort study. Adult men and women were identified using ICD-9/ICD-10 codes. Screened patients were only included if they received heparin, but excluded if they received multiple loading doses before the first monitoring level. Patients were placed into cohorts based on their initial heparin bolus dose into three cohorts: 80 units per kilogram or greater (n equals 15), less than 80 units per kilogram (n equals 14), or no bolus (n equals 4). The primary endpoint was time until heparin is therapeutic, defined as a therapeutic lab draw of activated partial thromboplastin time, Anti-Xa, or activated clotting time. Secondary outcomes were all cause mortality at 30 days and at 1 year, limb salvage during hospitalization, 30 day rehospitalization, number of tests before therapeutic levels, rates of heparin induced thrombocytopenia, and receipt of protamine or transfusion. Data was analyzed using non-parametric tests or chi-squared tests.

Results: The average time to therapeutic heparin levels for no bolus, low dose, and high dose were 31.3 hours, 11.5 hours, and 28 hours respectively (p equals 0.081). High dose heparin had

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fewer deaths at 30 days compared to low dose. No patients died in the high dose heparin cohort, but four (28%) patients died who received low dose heparin group (p equals 0.204). Mortality at 1 year for high dose, low dose, and no bolus cohorts were 13%, 50%, and 25% respectively (p equals 0.456). Thirty day rehospitalization was comparable among the groups with 100%, 86%, and 100% for the no bolus, low dose, and high dose cohorts respectively (p equals 0.236).

Conclusion: The use of high dose heparin (80 units per kilogram or greater) in acute limb ischemia trended towards less death than low dose heparin (less than 80 units per kilogram). However, lower dose heparin had less rehospitalization and achieved therapeutic heparin monitoring levels quicker. The clinical significance of these competing benefits needs to be evaluated with a larger prospective trial.

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Session-Board # - 4-033

Poster Title: Patient characteristics and statin prescribing patterns after an acute cardioembolic stroke

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: The benefits of statin therapy in the secondary prevention of ischemic strokes is well established. However, the role of statins in strokes with a cardioembolic origin remains unclear with providers having little evidence to provide support in clinical decision-making. The purpose of this project is to evaluate statin prescribing patterns and identify patient characteristics associated with cardioembolic strokes.

Methods: This study was approved by the institutional review board. This was a retrospective, observational study evaluating patients who experienced an ischemic stroke of cardioembolic or non-cardioembolic nature. To be included in the study, patients had to be greater than 18 years of age and have been admitted to the hospital between January 2011 and December 2016 with a primary diagnosis of an acute stroke. Patients experiencing a hemorrhagic stroke were excluded. The primary focus of the evaluation was to quantitatively and qualitatively evaluate patient characteristics and the use of statins in patients with cardioembolic strokes. Secondly, cardioembolic stroke patients were qualitatively compared to patients experiencing a non-cardioembolic ischemic stroke. Descriptive statistics and T-tests were used to analyze patient characteristics, outcome measures, and comparisons between groups.

Results: A total of 403 ischemic strokes occurred during the study period, of which 9.2% (n=37) were deemed to be cardioembolic in origin. Among those with a cardioembolic stroke, 54.1% (n=21) were female, with an average age of 72.3 ± 11.5 years, and a mean CHA₂DS₂-VASc of 4.5. After experiencing a cardioembolic stroke, 77.4% (n=24) of patients received statin therapy and 45.1% (n=14) of those were on statin therapy prior to admission. High intensity statin therapy was used in 18 patients (75.0%) whereas 5 patients (20.8%) received moderate intensity and 1

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patient (4.2%) received low intensity. Compared with the non-cardioembolic population, patients with a cardioembolic strokes were similar in average age (72.3 years vs 58.0 years , $p=0.17$) and sex (54.1% female vs 40.2% female, $p=0.10$) but were less likely to be placed on statin therapy (77.4% vs 99.6%, $P<0.05$).

Conclusion: Patients who experienced a cardioembolic stroke were similar in age and sex to those with a non-cardioembolic ischemic stroke. Statins were used in a majority of patients with cardioembolic strokes but less so than patients with an ischemic stroke of non-cardioembolic nature.

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Session-Board # - 4-034

Poster Title: Vasospastic myocardial infarction following use of synthetic marijuana

Poster Type: Case Report

Submission Category: Cardiology / Anticoagulation

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Purpose: A 53 year old male with a past medical history significant for hypertension and GERD presented to the ED after a possible seizure episode. He reports that he had smoked some “spice” (a synthetic marijuana derivative), felt euphoric, and proceeded to lose consciousness. While on the ground, his legs were observed to shake in a tonic-clonic manner. This was the patient’s first experience with spice and the patient denied any alcohol, tobacco, or other illicit drug use recently. He was apparently unconscious for less than 2 minutes as described by friends who were present. He denied any vision changes or focal neurological deficits. Of note, the patient had a remote history of a small right posterior thalamus hemorrhage 3 years prior. On admission, a CT of the brain showed an unchanged lesion as compared to the CT 3 years ago. The patients’ only complaint was mild chest discomfort described as being similar in nature to his normal GERD symptoms. Initial physical exam revealed no abnormalities. The patient was initially hypotensive with a blood pressure of 93/56 with a heart rate of 71 BPM. All labs were within normal limits with the exception of an elevated Serum creatinine of 1.59 mg/dL, which resolved after IV rehydration. Of note, the patients’ cardiac enzymes were negative (CK 53 units/L, CKMB <1 ng/ml, Troponin <0.015 ng/ml,) and he had a normal urine drug screen. His initial ECG showed ST elevation greater than 0.08mV in leads II, III, and AVF. When repeated 2 hours later, his ECG was read as normal sinus rhythm with ST elevation suggestive of early repolarization.

Repeat cardiac enzymes increased within 6 hours (CK 303 units/L, CKMB 15.5 ng/ml, Relative Index 5%, Troponin 1.72 ng/ml) and were significantly elevated 12 hours from admission (CK 632 units/L, CKMB 52.5 ng/ml, Relative Index 8%, Troponin 13.5 ng/ml) resulting in cardiac catheterization. Angiography revealed only non-obstructive coronary artery disease with no significant lesions or need for revascularization. At the time of the heart catheterization, his ECG revealed normal sinus rhythm with no abnormalities. His troponin began to normalize (10.3 ng/ml) while his othe enzymes had not yet peaked (CK 660 units/L, CKMB 55.7 ng/ml)

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The patient was diagnosed with a vasospastic (type II) myocardial infarction (MI) secondary to illicit drug use. A noninvasive treatment strategy was employed including aspirin 81mg daily, clopidogrel 75mg daily, amlodipine 10m daily, and atorvastatin 80mg as well as illicit drug cessation counseling. In this case, the role synthetic marijuana as the culprit for vasospastic ischemia is supported chronology, temporal biomarker and ECG trends, and non-obstructed coronary arteries. Based on the Naranjo nomogram, the causality of spice was evaluated as Probable (score =7).

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Session-Board # - 4-035

Poster Title: Development and implementation of a novel tool for med-induced QTc monitoring and review of physician feedback

Poster Type: Descriptive Report

Submission Category: Cardiology / Anticoagulation

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Purpose: QTc prolongation caused by medications has long been associated with fatal arrhythmias, in-particular torsades de pointes. Our institution implemented a process in which physicians were contacted if the QTc was > 470 and a QTc prolonging drug was ordered. Physician complaint of phone call fatigue for invalid QTc warnings prompted the development of a QTc monitoring tool. This project was designed to decrease unnecessary physician phone calls, educate pharmacists on validity of QTc warnings, standardize documentation of QTc interventions and improve physician/pharmacist communication regarding medication QTc prolongation.

Methods: The pharmacy clinical team developed a process for scoring medication induced QTc prolongation. The process involved literature review, QTc tool development, pharmacist education, standardized documentation template to use in electronic medical record and data collection. Pharmacists used the QTc tool to document the patient's QTc value, age, sex, and current potassium and current magnesium levels. Additionally, pharmacists documented the patient's medications with the potential of QTc prolonging, presence of heart block, atrial fibrillation with heart rate greater than 120 bpm and/or in situ pacemaker. Each criterion was assigned a point value and weighted dependent on likelihood of causing an arrhythmia. The QTc criteria point value determined whether the pharmacist continued to monitor or contacted physician for a change in therapy. Retrospective data was collected for three months prior to tool implementation and three months after tool implementation.

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Results: Pharmacists were educated on using the QTc tool, computer documentation, further monitoring parameters of patients with risk for QTc prolongation and when to contact a physician. As a result of the QTc tool, physician phone calls decreased by 22%. Unnecessary pharmacist documentation of insignificant QT intervals and non-significant drug interactions also decreased.

Conclusion: As a result of the implementation of the QTc tool, physician phone calls were decreased and standardization in pharmacist documentation/intervention was accomplished. The project helped to improve pharmacists' to interpret QTc results, to assess the validity of QTc results and when to recognize contact prescribers.

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Session-Board # - 4-036

Poster Title: Assessing the impact of sacubitril/valsartan on cardiovascular remodeling parameters

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: The drug sacubitril/valsartan has been found to reduce the risk of cardiovascular death and hospitalization from heart failure in the PARADIGM-HF trial and is now considered a preferred treatment. Cardiac remodeling is common in patients with heart failure and has an association with increased morbidity and mortality due to neurohormonal activation. This activation can be attenuated by vasoactive peptides such as B-type natriuretic peptide (BNP). Sacubitril inhibits the proteolytic enzyme neprilysin, which increases BNP levels. Parameters from echocardiograms are commonly used to assess cardiac remodeling. Studies are lacking which measure the impact of valsartan/sacubitril on specific cardiovascular remodeling parameters.

Methods: A total of 40 patients in a private cardiologist's clinic with a history of reduced ejection fraction (less than 40 percent) heart failure were either switched to or had sacubitril/valsartan added to existing heart failure therapy, of which 75 percent (n equals 30) were currently taking an angiotensin converting enzyme inhibitor or an angiotensin II receptor blocker (ARB). The other 25 percent (n equals 10) were newly diagnosed with heart failure and initiated on sacubitril/valsartan, which is a combination drug of a neprilysin inhibitor and an ARB which was approved in 2015 to treat heart failure with reduced ejection. An echocardiogram was performed both prior to and after the patient was switched to sacubitril/valsartan, with the average being 12 months after the switch. Pre- and post-measures of cardiac remodeling which were obtained from the echocardiograms included calculated left ventricular ejection fraction (CalLVEF), visual left ventricular ejection fraction (VisLVEF), left

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atrial volume (LA), and left ventricular internal diameter end diastole (LVIDd). Data were analyzed retrospectively via one-tail, paired t-tests to evaluate for decreases in LA and LVIDd and for increases in CalLVEF and VisLVEF after drug treatment, with P less than 0.05 indicating a significant change. A Spearman test was also conducted to identify two-way correlations between the percent changes as calculated from the pre- and post-measures of cardiac remodeling.

Results: There was a significant (P equals 0.011) decrease (n equals 39, mean 0.3 centimeters (cm)) in the LVIDd and a significant (P equals 0.015) increase (n equals 17, 6.77 points) in the VisEF after the switch to sacubitril/valsartan. There was a trend (P equals 0.146) toward an increase (n equals 37, mean 2.19 points) in the CalLVEF after the switch to sacubitril/valsartan, while no decrease was detected (P equals 0.401) in the LA parameter (n equals 37, mean 0.01 cm). A significant (P equals 0.009) negative association (r equals negative 0.431, n equals 36) was found between the percent change of LVIDd and the percent change in CalLVEF, suggesting a larger percent decrease in LVIDd was indirectly associated with a higher percent increase in CalLVEF after drug treatment. There was a similar trend (P equals 0.171) toward a negative association (r equals negative 0.373, n equals 15) between the percent change of LVIDd and the percent change in VisLVEF.

Conclusion: Patients with established reduced ejection fraction heart failure experienced an improvement in three of the four echocardiographic parameters commonly associated with cardiovascular remodeling after taking the sacubitril/valsartan combination. Patients taking the drug showed a definite decrease in LVIDd and a trend upwards in CalLVEF. Visually estimated EF showed a statistically significant increase with sacubitril/valsartan. Nevertheless, VisLVEF is a more subjective measure and can be seen as a variable influenced by operator bias. This data supports other positive data published since the PARADIGM-HF trial and also suggests the need to further investigate the reported findings in large scale studies.

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Session-Board # - 4-037

Poster Title: Analysis of a large U.S. national study of patient satisfaction during a recent venous thromboembolism episode

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: Venous thromboembolism (VTE) including deep vein thrombosis or pulmonary embolism is a common disease associated with increased mortality, high recurrence rates, and substantial healthcare costs. Little is known about the specific factors contributing to VTE patient satisfaction, but improving satisfaction in the healthcare delivery is universally beneficial to improved patient experience. The purpose of this research is to examine current levels of patient satisfaction in a large U.S. national sample of VTE patients.

Methods: The institutional review board approved this national online survey, which was administered to 907 adult respondents who provided consent and had experienced a VTE event in the past 2 years. Respondents with cancer related VTE were excluded. The survey assessed patient satisfaction by 3 questions evaluated by a 5-point Likert-type scale from very dissatisfied to very satisfied. Based on your most recent VTE experience: 1) How satisfied were you with the care provided by the healthcare provider who was primarily responsible for the majority of your care? 2) How likely would you be to recommend the healthcare provider who was primarily responsible for the majority of your care to friends or relatives if they also experienced a VTE event? 3) How satisfied were you with the overall communications between healthcare providers (i.e., communications between primary care doctor, specialists, and other health care professionals) during your care? Each question was correlated to patient demographics (sex, age, race and ethnicity, income level, place of residence, current work status, and health insurance), patient harms (i.e., misdiagnosis, wrong treatment) experienced

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with VTE episode, number of lifetime VTE events, patient beliefs concerning VTE outcomes, and anticoagulant therapy pathways. Likert scale items were considered continuous variables for analysis. Linear regression was used to determine the effect of the independent predictors on the outcome variables, with P set less than 0.05.

Results: Respondents had a mean age of 52.4 years (14.4 SD). The majority were women (56.7 percent). The sample was predominantly Caucasian (88.6 percent) with representation of those of Hispanic ethnicity (10.6 percent) and African-American race (6.8 percent). Most were living in urban community residence, had health insurance, and an income level between 50,000 to 99,000 dollars. Most reported VTE events were DVT (63.8 percent). A single lifetime VTE event was experienced in 35.4 percent of respondents and 2 or more events in 64.6 percent of respondents. Satisfaction with the VTE care provided by the healthcare provider primarily responsible for care was most commonly rated as somewhat satisfied (23 percent). Respondents were very likely to recommend the healthcare provider primarily responsible for their care to others (Not Likely at All: 1 percent, Extremely Likely: 47 percent). However, respondents were only somewhat satisfied with communication between healthcare providers during their care. Satisfaction is correlated with a patient perception of a mistake made in their VTE care, specifically a wrong diagnosis or treatment, or delayed treatment.

Conclusion: Respondents to a large national online survey who had suffered a VTE event in the past 2 years were somewhat satisfied with their VTE care and communication between their healthcare providers during treatment. They were very likely, however, to recommend the provider to family and friends. VTE care in the United States can be improved which presents an opportunity for pharmacists.

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Session-Board # - 4-038

Poster Title: Impact of a change in preferred pharmacologic nuclear stress testing agent from regadenoson to adenosine in a community hospital

Poster Type: Evaluative Study

Submission Category: Cardiology / Anticoagulation

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Purpose: The American Society of Nuclear Cardiology Imaging Guidelines list dipyridamole, adenosine, and regadenoson as the coronary vasodilator agents available for pharmacologic stress testing. Since 2010, regadenoson has been the preferred agent at this institution due to intermittent availability of dipyridamole and prescriber perception of more adverse effects with use of adenosine. Due to a significantly higher acquisition cost for regadenoson, restriction criteria were implemented and adenosine was given preferred formulary status. The purpose of this study was to evaluate the impact of switching agents on incidence of adverse events, need for a rescue agent and financial impact to the institution.

Methods: This study was a single center, retrospective cohort study comparing adverse effects from pharmacologic stress agents before (February-March 2018) and after (April-May 2018) implementation of a regadenoson formulary restriction program. After implementation of the program, regadenoson was restricted to use in patients with severe chronic obstructive lung disease (COPD) or asthma who were actively using rescue inhalers on the day of stress testing. All other patients were to receive an adenosine stress test. Demographics, comorbidities, and adverse event data were collected on 60 consecutive patients both before (patients receiving regadenoson) and after (patients receiving adenosine) restriction criteria were implemented. Drug expenditure for pharmacologic stress agents was also compared before and after the restriction.

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Results: A total of 120 patients (60 per group) were evaluated for this study. There were no significant differences in patient demographics. More patients treated with regadenoson had COPD compared those who received adenosine (13 vs. 4 patients, $p=0.03$). There was no significant difference in the number of patients who experienced at least one adverse event between the two groups (52 vs. 58 patients, $p=0.1$), however significantly more patients in the regadenoson group experienced chest pain compared to the adenosine group (21 vs. 11 patients, $p=0.03$). In addition, a rescue agent was administered more frequently to patients who received regadenoson compared to adenosine (16 vs. 7 patients, $p=0.03$). Total drug expenditure for pharmacologic stress agents was decreased by 78% following implementation of regadenoson restriction criteria.

Conclusion: Adenosine is a safe alternative to regadenoson for nuclear stress testing and resulted in less frequent reversal agent use, equivalent or fewer adverse events, and decreased drug expenditure.

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Session-Board # - 4-039

Poster Title: Risk of diabetic ketoacidosis in patients with type II diabetes mellitus upon dapagliflozin initiation

Poster Type: Case Report

Submission Category: Clinical Topics / Therapeutics

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Purpose: This case report illustrates the potential risk of diabetic ketoacidosis (DKA) in patients with type II Diabetes Mellitus (T2DM) who are abruptly switched from long-term insulin therapy to oral hypoglycemic therapy regimen including the relatively new agent Dapagliflozin. A 61 years old female with history of T2DM for 15 years was brought to the emergency department (ED) by her family with complaints of nausea, vomiting, fatigue, polyuria, palpitations, and dizziness for 1 day. Her antidiabetic drug regimen was recently changed from insulin (regular and NPH insulin) to oral Dapagliflozin 10 mg once daily, Sitagliptin-Metformin 50/1000 mg twice daily and Pioglitazone 15 mg once daily. On examination, the patient was conscious, oriented, afebrile, normotensive but tachycardic (heart rate: 126 beats per minute). Blood workup showed glucose value of 306 mg/dL, bicarbonate 14 mmol/L, ketones (B-hydroxybuterate) 5.9 mmol/L, pH 7.26, sodium 131 mmol/L, potassium 4.7 mmol/L and chloride 102 mmol/L. This implicated DKA with positive anion gap of 15. The patient was admitted to the medical ward and was started on intravenous normal saline with potassium 20 mEq/L and continuous intravenous insulin infusion and was monitored after the first hour and then every 2 hours. The patient had a rapid response to insulin infusion; after the infusion of 6 units/hour (0.1 units/kg) for 3 hours, glucose level dropped from 306 mg/dL to 140 mg/dL. The intravenous normal saline was changed to 5% dextrose and normal saline and insulin infusion rate was reduced to 2 units/hour. Her clinical status improved and lab findings after 4 hours of starting the management showed resolve of the DKA. Consequently, she was discharged home with basal bolus insulin regimen. Dapagliflozin and other oral medications were stopped. Other common precipitating factors for DKA were ruled out as there was no evidence of infection, trauma, myocardial infarction, alcohol or substance abuse. DKA was highly triggered by Dapagliflozin

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initiation and sudden discontinuation of insulin. The patient was followed up in the outpatient clinic and she was comfortably controlled on insulin. Sodium-Glucose Cotransporter 2 (SGLT2) inhibitors as Dapagliflozin stimulate several mechanisms that could precipitate DKA. Inhibition of SGLT2 that are expressed in α -cells in the pancreas stimulates glucagon secretion. In addition, SGLT2 inhibitors reduce the excretion of ketone bodies through urine which could raise serum ketone levels. DKA associated with SGLT2 inhibitors is well reported in patient with type I Diabetes Mellitus but not as such in patients with T2DM. Furthermore, insulin dose reduction and/or discontinuation due to Dapagliflozin initiation in order to avoid hypoglycemia-are also known risk factors for ketosis.

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Session-Board # - 4-040

Poster Title: Long-term effect of tiotropium plus olodaterol fixed-dose combination therapy on heart rate and blood pressure in chronic obstructive pulmonary disease patients

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Cardiovascular comorbidities are common in chronic obstructive pulmonary disease, and are associated with worse prognosis. The pharmacology of long-acting beta-adrenoceptor agonists and long-acting muscarinic antagonists suggests an inherent potential to increase heart rate and blood pressure. However, previous studies demonstrated no negative influence by tiotropium or olodaterol monotherapy on heart rate and blood pressure. TONADO® studies confirmed tiotropium plus olodaterol efficacy and safety in Global Initiative for Chronic Obstructive Lung Disease stage 2-4 patients with chronic obstructive pulmonary disease (1). This post hoc analysis of TONADO® studies assessed tiotropium plus olodaterol treatment effect on heart rate and blood pressure.

Methods: The 52-week, phase III TONADO® studies (NCT01431274 and NCT01431287) evaluated fixed-dose tiotropium 5 microgram plus olodaterol 5 microgram, and monotherapy with tiotropium 5 microgram or olodaterol 5 microgram via the Respimat® inhaler, in Global Initiative for Chronic Obstructive Lung Disease 2-4 chronic obstructive pulmonary disease patients. In this post hoc analysis, long-term changes from baseline in resting heart rate (using electrocardiograms) and resting blood pressure (whilst sitting) were analyzed at weeks 12, 24, and 52 using pre-dose measurements. Informed consent was obtained from all patients included in TONADO® studies.

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Results: A total of 5163 patients were randomized to receive treatment in the TONADO® studies (1). In this post hoc analysis, 3058 patients were analyzed for heart rate and 3062 patients were analyzed for blood pressure. Over 52 weeks, small changes in mean heart rate [less than 2 beats per minute (bpm)] and reductions in mean blood pressure (less than 2 mmHg) were observed from baseline for all treatments arms. At week 52, the mean change from baseline in heart rate for tiotropium 5 microgram plus olodaterol 5 microgram, tiotropium 5 microgram, and olodaterol 5 microgram groups was 0.319 bpm [Standard error (SE), 0.318; 95 percent confidence interval (CI) minus 0.305 to 0.944; p, 0.3163], 1.239 bpm (SE, 0.325; 95 percent CI 0.601 to 1.876; p, 0.0001), and 0.192 bpm (SE, 0.327; 95 percent CI minus 0.449 to 0.833; p, 0.5572), respectively. Similar to the changes in heart rate, changes in systolic and diastolic blood pressure were quantitatively small and similar for tiotropium plus olodaterol treatment when compared with tiotropium or olodaterol monotherapy.

Conclusion: There was no indication of an additive effect on heart rate or blood pressure with fixed-dose combination of tiotropium plus olodaterol treatment when compared with either tiotropium or olodaterol monotherapy. This argues against relevant adverse clinical effects on heart rate and blood pressure for tiotropium plus olodaterol combination therapy in patients with chronic obstructive pulmonary disease.

Reference:

(1) Buhl R, Maltais F, Abrahams R et al. Tiotropium and olodaterol fixed-dose combination versus mono-components in COPD (GOLD 2-4). *Eur Respir J*. 2015 Apr; 45 (4):969-79.

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Session-Board # - 4-041

Poster Title: Characterization of adults with type 2 diabetes and controlled glycemia: a comparison of lifestyle management versus anti-hyperglycemic treatment

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Just over half of patients with type 2 diabetes in the United States have achieved glucose control in the past 15 years. Our study purpose was to evaluate the sociodemographic, clinical, dietary, exercise, and other behavioral characteristics of patients with type 2 diabetes who have achieved glycemic control and to further compare those on lifestyle management (LM) alone to those on antihyperglycemic treatment (AHT).

Methods: A secondary database analysis study was conducted using the National Health and Nutrition Examination Survey (NHANES) of cohorts 2005-06 through 2013-14. The inclusion criteria consisted of participants 20 years of age and older that were diagnosed with type 2 DM and had a hemoglobin A1C < 6.5% at the time of examination. The population was separated into two study groups: AHT, in which the participants reported to be taking 1 or more antihyperglycemic medications at the time of the interview and LM group, which reported that they were not taking any antihyperglycemic medications at the time of interview. We compared sociodemographic, behavioral, dietary, diabetes related factors and clinical characteristics across study groups. Chi-square statistical test and Independent t-test with an alpha of 5% were used to compare these parameters.

Results: Most of the study participants were non-Hispanic whites and less than 65 years old. Just over 50% of participants were female with no more than a high school degree and a household income less than \$45k per year. The average duration of diabetes was about 8 years

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while a little over 50% of participants had been diagnosed within the first 5 years. We identified eight characteristics that were statistically different across study groups ($p < 0.05$): Age, health insurance, if they see one doctor for diabetes, A1C level, BMI, diastolic blood pressure, waist circumference, and LDL. The mean age of participants in the AHT group was higher (AHT 61, LM 58). Health insurance (92.0% AHT, 84.2% LM) and prescription coverage (91.6% AHT, 89.1% LM) were greater in the AHT group. The AHT group was more likely to see one doctor for diabetes. The A1C mean was higher in the AHT group (AHT 5.9%, LM 5.8%). Both groups had a BMI in the obese category and the AHT group showed a higher average (AHT 33, LM 31). Average diastolic blood pressure and LDL cholesterol were lower in the AHT group (DBP: AHT 67.6, LM 71.9, LDL: AHT 94, LM 105).

Conclusion: Patients with type 2 diabetes and controlled glucose levels were unexpectedly mostly overweight or obese, had dietary and sedentary times that were not healthy, and were of lower socioeconomic status. Those on LM alone were less likely to have insurance coverage and were less likely to be seen by one doctor for diabetes, but the cardiovascular risk factors were more favorable. It seems like other unexplored factors such as genetics may play a big role in glucose control.

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Session-Board # - 4-042

Poster Title: Forced vital capacity response to 2.5 microgram tiotropium Respimat in adult patients with moderate or mild symptomatic asthma

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Tiotropium, administered by Respimat soft-mist inhaler, is a well-tolerated and efficacious once-daily long-acting muscarinic antagonist (LAMA) that can be used as an add-on therapy to inhaled corticosteroids (ICS) with or without additional controller medications in adults with symptomatic asthma. Here we evaluated the impact of treatment on different measures of lung function in adults with mild or moderate asthma. We compared forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV1) response in patients with persistent asthma across the mild or moderate disease severities.

Methods: Lung function data from three Phase III clinical trials involving adult patients with moderate, or mild symptomatic asthma were compared in this post hoc analysis. Data were from pooled MezzoTinA-asthma trials (moderate symptomatic asthma: NCT01172808/NCT01172821, replicate 24-week trials, once-daily tiotropium 2.5 micrograms, 5 micrograms, or placebo, added onto ICS [400–800micrograms budesonide/equivalent]) and GraziaTinA-asthma trial (mild symptomatic asthma: NCT01316380, 12-week trial, once-daily tiotropium 2.5 micrograms, 5 micrograms, or placebo, added onto ICS [200–400 micrograms budesonide/equivalent]). However, data from only 2.5 micrograms, the US-approved dose, are reported here. All clinical research presented in this abstract was conducted according to ICH good clinical practice guidelines and approved by the appropriate ethics committee or institutional review board. All patients provided written informed consent prior to any trial-related procedure.

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Results: In patients with moderate (1042 patients; tiotropium 2.5 micrograms, n equals 519; placebo n equals 523) or mild asthma (309 patients; tiotropium 2.5 micrograms, n equals 154; placebo n equals 155), tiotropium (2.5 micrograms), compared with placebo, provided significant improvements in peak FEV1 (0-3h) (223 mL [95 percent CI: 185, 262], P less than 0.0001 for moderate asthma and 159 mL [95 percent CI: 88, 230], P less than 0.0001 for mild asthma), and in trough FEV1 (180 mL [95 percent CI: 138, 221], P less than 0.0001 for moderate asthma and 110 mL [95 percent CI: 38, 182], P equals 0.028 for mild asthma). Compared with placebo, the addition of tiotropium 2.5 micrograms in patients with moderate or mild asthma provided significant improvements in peak FVC (141 mL [95 percent CI: 98, 183], P less than 0.0001 for moderate asthma and 106 mL [95 percent CI: 23, 188], P equals 0.0119 for mild asthma) and in trough FVC (107 mL [95 percent CI: 62, 152], P less than 0.0001 for moderate asthma, and 98 mL [95 percent CI: 13, 183], P equals 0.0236 for mild asthma).

Conclusion: In this dataset, addition of 2.5 microgram tiotropium Respimat to maintenance therapy improves FEV1 and FVC in patients with moderate or mild asthma; the impact was greater in those with moderate asthma, possibly due to airway remodeling and hyper-inflation.

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Session-Board # - 4-043

Poster Title: Therapeutic interchange protocol of orally inhaled medications to administration via nebulizer: impact on the incidence of therapeutic duplication

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

Primary Author: Jason Glick; Dignity Health - St. Rose Dominican;

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Elizabeth Gonzalez

Purpose: With the increasing number and variety of respiratory combination products, health care providers are not always aware of the individual medication components. In the inpatient setting, Albuterol and ipratropium nebulization orders found on numerous physician order sets are regularly ordered in addition to home regimen inhalers. Therapeutic duplication may often be unrecognized and uncorrected, particularly when different treatment modalities are administered by respiratory therapists and nurses. This study aims to measure if a protocol requiring pharmacists to therapeutically interchange all oral inhalers to nebulized (neb) alternatives results in fewer instances of therapeutically duplicate doses being administered to patients.

Methods: We conducted a retrospective evaluation of the incidence of therapeutic duplication with respiratory medications in hospitalized patients. The incidence before (control group) and after (study group) the initiation of the therapeutic interchange protocol were compared. Both groups were analyzed over the same calendar months to control for seasonal variation. Therapeutic duplication was defined as; multiple long acting agents of the same class given on the same day, long acting agents and short acting agents of the same class given on the same day, or short acting agents of the same class administered within three hours of each other. The study population included all patients initiated on respiratory medications. Steroid inhalers were converted to budesonide neb twice daily, combination steroid/long-acting beta-2 adrenergic agonist (LABA) inhalers were converted to budesonide/arformoterol neb twice daily, and anticholinergic inhalers were converted to ipratropium neb every six hours. If a patient was scheduled to receive ipratropium every six hours, and arformoterol neb, the arformoterol was subsequently converted to albuterol neb every six hours to be given with the ipratropium.

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Primary endpoints were the number of therapeutically duplicate doses administered between the two groups per patient stay and per day of therapy.

Results: Patients on respiratory medications were identified (control group, n equals 2402; study group, n equals 2777). The incidence of therapeutic duplication per patient stay was reduced from 1.49 doses to only 0.17 doses (p value less than 0.001). The incidence of therapeutic duplication per day of therapy was reduced from 0.41 doses to only 0.05 doses (p value less than 0.001). Statistically significant reductions were also found with LABA given on the same day as albuterol, tiotropium given on the same day as ipratropium, two different steroids given on the same day, ipratropium doses given within 3 hours of each other, and albuterol inhalers given within 3 hours of an albuterol neb.

Conclusion: Simplification and clarification of physician orders by a pharmacist, facilitated by a therapeutic interchange of oral inhalers to nebulizer agents resulted in a 98 percent relative reduction of therapeutically duplicate doses being administered to patients.

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Session-Board # - 4-044

Poster Title: Therapeutic interchange protocol of orally inhaled medications to administration via nebulizer: impact on the incidence and cost of wasted doses

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

Primary Author: Jason Glick; Dignity Health - St. Rose Dominican;

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Purpose: Oral inhalers often contain more doses than needed during the average hospital length of therapy. Partially used multi-dose inhalers are discarded upon order discontinuation or discharge, leading to waste. Additionally, replacement inhalers are often sent when they are mishandled or misplaced, increasing waste and costs. Conversely, doses for nebulizer administration are available in unit of use packaging. This study aims to measure; the incidence of wasted doses and inhalers per patient and per treatment day, and the impact on the incidence of waste of a protocol requiring pharmacists to therapeutically interchange all oral inhalers to nebulized (neb) alternatives.

Methods: We conducted a retrospective evaluation the incidence of wasted respiratory medications in hospitalized patients. The incidence and cost of wasted medication before (control group) and after (study group) the initiation of the therapeutic interchange protocol were compared. Both groups were analyzed over the same calendar months to control for seasonal variation. Steroid inhalers were converted to budesonide neb twice daily, combination steroid/long-acting beta-2 adrenergic agonist (LABA) inhalers were converted to budesonide/arformoterol neb twice daily, and anticholinergic inhalers were converted to ipratropium neb every six hours. If a patient was scheduled to receive ipratropium every six hours, and arformoterol neb, the arformoterol was subsequently converted to albuterol neb every six hours to be given with the ipratropium. The total available doses from oral inhalers charged to patients were compared to medication doses charted in the MAR. The remaining available doses were considered wasted. When multiple inhalers for a patient were charged, if the remaining doses were in excess of a full unused inhaler, it was assumed a replacement dose was required from pharmacy due to mishandling or misplacement of the inhaler. Primary

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endpoints were: the number of wasted doses per patient, the number of replaced inhalers per patient, the cost associated with wasted doses, and replaced inhalers.

Results: The control and study groups consisted of 2402 and 2777 patients, respectively. Of the 909 oral inhalers charged to any group during the study period, 207 (18 percent) were replacement inhalers due to mishandling or misplacing the original inhaler. Cost of all oral inhaler waste was reduced from 20.6 dollars to 0.55 dollars per patient (p value less than 0.001). Cost to replace mishandled or misplaced inhalers was reduced from 6.29 dollars to 0.06 dollars per patient (p value less than 0.001). The number of inhaler doses wasted was reduced from 17,528 to 4,480, and the cost of waste was reduced from 49,471 dollars to 1,534 dollars.

Conclusion: A therapeutic interchange protocol of oral inhalers to nebulized doses resulted in statistically significant reductions in the number of inhalers wasted, doses wasted, and dollars spent on wasted inhalers.

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Session-Board # - 4-045

Poster Title: Therapeutic interchange protocol of orally inhaled medications to administration via nebulizer: effect on workload of respiratory therapists and registered nurses

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

Primary Author: Jason Glick; Dignity Health - St. Rose Dominican;

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Purpose: Acquisition costs for respiratory medications may be decreased by transitioning from oral inhalers to nebulized doses. Many hospitals utilize registered nurses to administer inhalers, while respiratory therapists are required to administer nebulized doses. A perceived increase in respiratory therapist workload could make the protocol impractical, thus negating the potential cost savings benefit. This study aims to measure the changes in workload for respiratory therapists and registered nurses after implementing a protocol requiring pharmacists to therapeutically interchange all oral inhalers to nebulized (neb) alternatives.

Methods: We conducted a retrospective evaluation of staff workload utilized to administer respiratory medications to hospitalized patients. The workload before (control group) and after (study group) the initiation of the therapeutic interchange protocol was compared. Both groups were analyzed over the same calendar months to control for seasonal variation. Steroid inhalers were converted to budesonide neb twice daily, combination steroid/long-acting beta-2 adrenergic agonist (LABA) inhalers were converted to budesonide/arformoterol neb twice daily, and anticholinergic inhalers were converted to ipratropium neb every six hours. If a patient was scheduled to receive ipratropium every six hours, and arformoterol neb, the arformoterol was subsequently converted to albuterol neb every six hours to be given with the ipratropium. Respiratory therapists may administer multiple medications to a patient during a single patient treatment. Nebulized doses documented as administered within one hour of the previous dose(s) were considered part of the same patient treatment. Likewise, any inhaler doses administered within one hour of each other were also considered one treatment. The primary endpoints were total respiratory treatments per patient, and treatments per patient day. The

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secondary endpoints were treatments administered by respiratory therapists per patient and per patient day, or treatments administered by nurses per patient and per patient day.

Results: The control and study groups consisted of 2402 and 2777 patients respectively. A slight decrease in treatments per patient day was found, 2.03 compared to 2.00 (p value equals 0.45). Respiratory therapist treatments per day increased from 1.86 to 1.98 (p value less than 0.001), while nursing treatments per day decreased from 0.18 to 0.02 (p value less than 0.001). We found decreases in total number of treatments per patient, 11.62 versus 10.53 (p value equals 0.057), the number of respiratory therapy treatments per patient, 10.81 to 10.49 (p value equals 0.58), and the number of nursing treatments per patient, 0.81 to 0.03 (p value less than 0.001). The number of treatment days per patient was higher in the control group, 3.7, versus the study group, 3.4 (p value equals 0.11).

Conclusion: A therapeutic protocol converting oral inhalers to nebulized doses did not result in a significant increase to combined respiratory/nursing staff workload. The decline in the number of treatments per patient may partially be explained by a decrease in the number of days patients received respiratory treatments. Respiratory therapist workload concerns were not prohibitive to protocol implementation.

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Session-Board # - 4-046

Poster Title: Therapeutic interchange protocol of orally inhaled medications to administration via nebulizer: financial impact

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

Primary Author: Jason Glick; Dignity Health - St. Rose Dominican;

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Purpose: Oral multi-dose inhalers often contain more doses than needed during the average hospital length of therapy. Partially used inhalers are discarded upon order discontinuation or discharge, leading to waste. Additionally, replacement inhalers when they are mishandled, or misplaced, increasing waste and costs. Conversely, doses for nebulizer administration are available in unit of use packaging. This study aims to measure the financial impact of a protocol requiring pharmacists to therapeutically interchange all oral inhalers to nebulized (neb) alternatives.

Methods: This was a retrospective study of patients receiving respiratory medications during two three month periods, from December 2016 thru February 2017 and from December 2017 thru February 2018, before (control) and after (study) the initiation of the therapeutic interchange protocol. The same calendar months were selected to control for seasonal variation. Steroid inhalers were converted to budesonide neb twice daily, combination steroid/long-acting beta-2 adrenergic agonist (LABA) inhalers were converted to budesonide/arformoterol neb twice daily, and anticholinergic inhalers were converted to ipratropium neb every six hours. If a patient was scheduled to receive ipratropium every six hours, and arformoterol neb, the arformoterol was subsequently converted to albuterol neb every six hours to be given with the ipratropium. The usage and cost of all respiratory medications documented on the medication administration record were compared. The purchase price for all items was adjusted to the current acquisition cost as of May 2018 to control for price fluctuations. Primary endpoints were cost per patient and cost per day of therapy.

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Results: The control and study groups consisted of 2402 and 2777 patients, respectively. Respiratory medication cost per treatment day was reduced from 9.18 dollars to 2.47 dollars (p value less than 0.001). Similarly, respiratory medication cost per patient was reduced from 32 dollars to 11 dollars (p value less than 0.001). Net savings over the three month study period was 58,000 dollars.

Conclusion: A therapeutic interchange protocol converting oral inhalers to nebulized doses resulted in a significant cost reduction in respiratory medication.

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Session-Board # - 4-047

Poster Title: Effect of an insulin pump orderset on the safety and efficacy of insulin pumps in hospitalized patients

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

Primary Author: Brad Hein; University of Cincinnati;

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Purpose: Insulin pumps are increasingly utilized in patients with diabetes. When insulin pump patients are admitted to the hospital, the risk of complications is substantial due to many factors, including patient illness and institutional unfamiliarity. The purpose of this study was to evaluate the effect of an insulin pump orderset on the safety and efficacy of insulin pumps for patients who continued them during their admission.

Methods: This institutional review board-approved retrospective chart review evaluated patients who were admitted and continued on an insulin pump between August 1, 2016 and July 30, 2017. This 'POST' orderset group was compared to a 'PRE' group previously evaluated July 1, 2012 to June 30, 2013. Patients were excluded if they were admitted in diabetic ketoacidosis, admitted to the intensive care unit or admitted to obstetrics. Data was collected on demographics, documentation of cognitive assessments, pump presence and endocrine consults. Data was also collected on the administration (both purposeful and accidental) of concomitant subcutaneous insulin as well as reasons for pump interruptions. Finally, POST blood glucose data was compared against PRE data as well as a hospital control group of all patients with blood glucose values during the POST time period. Data was analyzed with chi square and student t test as appropriate.

Results: The POST group had 100 patients and the PRE group had 86 patients. Baseline demographics and blood glucose control was similar between the groups. 100 percent of patients in the POST group had cognitive assessments performed by a nurse every shift, had documentation of the presence of the insulin pump on the day of admission and had an

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endocrinology consult. For the PRE group, this was 83 percent, 91 percent and 86 percent, respectively ($p < 0.05$ for all). The rate of accidental concomitant subcutaneous insulin administration decreased substantially from 33 percent of patients down to 0 percent ($p < 0.05$). Pump interruptions increased in the POST group (20 to 35 percent, $p < 0.05$), mostly due to procedures and temporary conversion to a basal-bolus-correctional regimen. Blood glucose control improved in the POST group, with a decrease in values greater than 300 mg/dL by 4 percent. There was also a slight decrease in hypoglycemia (defined as a blood glucose less than 70 mg/dL) by 1.3 percent. Finally, 40.6 percent of patients in the POST group had blood glucose values greater than 200mg/dL as compared to 29.2 percent for the hospital control (difference 11.4 percent, $p < 0.05$).

Conclusion: The implementation of an insulin pump orderset greatly improved the safety of insulin pumps that are continued in hospitalized patients. Blood glucose control for insulin pump patients improved slightly from several years ago, but was not as tightly controlled when compared to non-pump patients. There were limitations to the non-pump population as the data included patients who did not have diabetes. A future study is planned to evaluate glucose control between baseline insulin pump patients who stay on the pump during the hospital stay versus those that come off.

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Session-Board # - 4-048

Poster Title: Cost-saving opportunities among hospitalized community-acquired pneumonia patients treated with omadacycline, an aminomethylcycline antibiotic with IV and oral formulations, compared to ceftriaxone and macrolide therapy

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Omadacycline is an oral (PO) and intravenous (IV) once-daily antibiotic that is under development for the treatment of patients with community-acquired bacterial pneumonia (CABP). The objective of the study was to identify the hospital length of stay (LOS) reduction required for omadacycline treatment to confer cost savings relative to ceftriaxone plus a macrolide therapy from the hospital system and managed care perspective. The rationale for this analysis was based on numerous studies across various infection types which demonstrated that antibiotics with IV and PO formulations can shorten hospital stay relative to treatment with antibiotics with IV-only formulations like ceftriaxone.

Methods: A decision-analytic, cost-minimization model from the hospital system perspective was constructed to compare costs associated with ceftriaxone plus a macrolide versus omadacycline treatment (IV in hospital and discharge home on PO) among hospitalized CABP patients of Pneumonia Severity Index (PSI) Class III or IV, stratified by Charlson Comorbidity Index (CCI). Both PSI and CCI were derived from ICD-9 diagnosis codes. Inputs for hospital LOS by PSI class and CCI score among hospitalized CABP patients who received ceftriaxone and azithromycin were obtained from a previous MedAssets database study (LaPensee K, et al. ISPOR 22nd Annual International Meeting. 2017; Boston, MA). Daily hospital costs (2,273 US dollars/day) for a hospitalized patient with CABP was obtained from a previously published study (Kozma CM, et al. J Med Econ. 2010;13:719-727). The daily costs for omadacycline were varied from 0 to 1,000 US dollars/day.

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Results: In the MedAssets Hospital Database, the median LOS for CABP patients in PSI Class III and IV were 5 and 6 days, respectively. From the hospital system and managed care perspective, omadacycline was cost saving with a 1-day hospital LOS reduction if the daily cost of omadacycline was less than or equal to 296 US dollars. Omadacycline was cost saving with a 2-day hospital LOS reduction if its acquisition cost was less than or equal to 584 US dollars.

Conclusion: As hospital reimbursement and antimicrobial stewardship programs are both increasingly tied to quality, efficiency, and cost of care, the present study examined the cost impact of shifting CABP patients from the current inpatient standard of treatment (ceftriaxone plus a macrolide) to inpatient IV omadacycline monotherapy treatment with early hospital discharge on the equivalent PO omadacycline. Cost savings may be realized with omadacycline relative to ceftriaxone plus a macrolide inpatient treatment if hospital LOS is reduced by 1 to 2 days with omadacycline IV-to-PO transition treatment. These findings need to be validated in the clinical or observational trial arena.

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Session-Board # - 4-049

Poster Title: Cost-savings analysis with use of omadacycline among hospitalized community-acquired pneumonia patients at risk of *Clostridium difficile* infection being treated with moxifloxacin: budget impact model findings

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Omadacycline is the first aminomethylcycline antibiotic in late-stage clinical development as once-daily intravenous and oral monotherapy for community-acquired bacterial pneumonia (CABP). In a phase 3 CABP study, 2 percent (8 patients) of moxifloxacin-treated patients developed *Clostridium difficile* infection (CDI), while no omadacycline-treated patients developed CDI. This finding was consistent with a recent meta-analysis showing that tetracycline antibiotics are associated with lower odds of CDI relative to fluoroquinolones (odds ratio, 0.62; 95 percent CI, 0.47-0.81; P less than .001) (Tariq R, et al. CID. 2018;66(4):514-22). The following analysis explored the management of hospitalized CABP patients treated with omadacycline or moxifloxacin.

Methods: The economic model was developed using a hospital perspective to estimate the budget impact of replacing the current strategy for the treatment of 100 hospitalized CABP patients with 5 days of moxifloxacin to 5 days of omadacycline. Costs included hospital room and board fees, drug acquisition costs (moxifloxacin: 46 US dollars/day, wholesale acquisition cost), and CDI adverse event treatment; the average cost-per-case attributed to hospital-onset CDI was 34,157 US dollars (Zhang S, et al. BMC Infect Dis. 2016;16(1):447). No additional adverse events were considered. Omadacycline acquisition cost was varied between 300 and 600 US dollars/day. Scenarios with incremental CDI incidence of moxifloxacin (0 to 12 percent) were undertaken to capture incidence uncertainty. The assumption was that treatment with

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omadacycline has a lower propensity to induce CDI relative to moxifloxacin and has the potential to avoid CDI events leading to a reduction in overall hospital costs.

Results: For every 100 patients treated with omadacycline versus moxifloxacin, the incremental cost of reductions in CDI rate with omadacycline ranged between 52,000 US dollars and 132,884 US dollars (cost saving) depending on the acquisition cost of omadacycline and CDI incidence for moxifloxacin (0 to 12 percent). Analysis showed that for omadacycline to become cost saving, the incidence of CDI in moxifloxacin-treated patients would need to range between 1.5 percent to 8.1 percent depending on the acquisition cost of omadacycline (300 to 600 US dollars/day).

Conclusion: The model illustrated the economic impact associated with reductions in CDI rates with omadacycline compared to moxifloxacin. As part of the analysis, the model demonstrates the incremental increase in CDI rates with moxifloxacin compared to omadacycline that conferred cost savings. Use of omadacycline has the potential to reduce the economic burden associated with hospitalized CABP patients treated with moxifloxacin if it can avoid approximately 2 to 8 cases of moxifloxacin-associated CDI per 100 patients. Future studies are required to identify CABP patients at greatest risk of moxifloxacin-associated CDI.

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Session-Board # - 4-050

Poster Title: Gastrointestinal tract recovery in patients undergoing selected surgical procedures

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Gastrointestinal (GI) tract complications are common in patients undergoing major surgical procedures. GI dysfunction following surgery has been most widely studied in patients undergoing abdominal surgery. The most frequent post-operative GI complications include a reduction in or absence of GI peristalsis. Impairment of GI peristalsis delays resumption of feeding and impairs oral drug and nutrient absorption. The primary objective of this exploratory analysis was to evaluate time required for the return of normal GI function following several common major types of surgeries. The secondary objective was to evaluate patient and surgery related variables and their association with GI tract recovery.

Methods: The institutional review board approved this retrospective medical record review of patients undergoing select surgeries at an academic medical center. One hundred consecutive men and women aged 19 to 80 years were included in each of six surgical procedures. The types of surgery included: (1) open laparotomy (OL); (2) laparoscopic (LAP); (3) cardiothoracic (CV); (4) total knee or hip arthroplasty (TKNA); (5) spinal surgery (SPIN); and (6) oncological surgery (ONC). GI tract function (GITF) was defined as the time to meet the following criteria: (1) positive bowel sounds; (2) passage of flatus or stool; and (3) tolerance of a solid diet. Patients with diabetic gastroparesis, end-stage renal disease (creatinine clearance < 15 ml/min), severe hepatic dysfunction (Child-Pugh class C) or a history of GI motility, malabsorption disorder, and inflammatory bowel disease were excluded from data collection. Continuous data were reported as medians and interquartile ranges while categorical data were reported as counts and proportions. Data were stratified by surgical type and compared using Fisher's exact test or the Kruskal-Wallis test based on data type; post-hoc testing was completed with the Dwass, Steel, Critchlow-Fligner multiple comparison analysis. A negative binomial

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regression model was selected to predict variables significantly associated with GI tract recovery time.

Results: The 600 subjects had a median age of 55.0 years, were 49.8% male, and had a median body mass index of 27.5 kg/m². GITF times were significantly different across the 6 surgical types ($p < 0.001$). ONC had the longest median GITF time (72 hours) while LAP (19 hours; $p < 0.001$) and TKNA (18 hours; $p < 0.001$) were associated with the shortest GITF time. GITF time in CV (41 hours) and OL (35 hours) were not different ($p = 0.170$), but longer than SPIN (22 hours; $p < 0.001$, respectively). A 6-hour increased duration of intubation (Rate Ratio (RR) = 1.12; $p < 0.001$), 10 mg/day increased morphine equivalent dose (RR = 1.06; $p = 0.034$), and psychological disorder (RR = 1.22; $p = 0.015$) were associated with increased OL GITF time. CV and TKNA GITF time was lower in males (RR = 0.87; $p = 0.023$) and morphine equivalent dose (RR = 0.94; $p < 0.05$), respectively. SPIN GITF time was associated with increased intubation duration (RR = 1.39; $p = 0.021$). ONC GITF was significantly higher for increased intubation time (RR = 1.08; $p = 0.007$) and morphine equivalent dose (RR = 1.24; $p = 0.012$).

Conclusion: This data identifies the duration of time for the return of GITF across six different surgical procedures. The surgical procedures were associated with significantly different GITF times. GITF times were independently associated with different clinical variables, but most common among these were duration of intubation and morphine equivalent dose. Careful clinical assessment is needed to determine when GI function normalizes following different types of surgery.

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Session-Board # - 4-051

Poster Title: Adult patients experiencing mild or moderate atopic dermatitis are significantly impacted by their condition: results from a real-world study in the United States

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Atopic dermatitis (AD), regardless of severity, can be associated with significant morbidity, negatively impacting the physical and mental health and health-related quality of life (HRQoL) of patients, their caregivers, and their families. The current study was conducted to investigate the impact of AD on patients experiencing mild or moderate disease.

Methods: Data were drawn from the Adelphi AD Disease Specific Programme, a cross-sectional survey of physicians and their adult AD patients (age ≥ 18 years) conducted in the United States between November 2014 and February 2015. All patients had a history of moderate to severe AD that could be mild at the time of data collection. Participating primary care physicians and dermatology specialists (n=202) completed information for 994 patients with AD of all severities, including current prescription AD therapies, clinical AD severity assessment (mild, moderate, severe) when current treatment was initiated and at the present visit, day-to-day symptoms, presence and number of acute episodes (flares), regions affected, body surface area (BSA), and all components of the Eczema Area and Severity Index (EASI). In addition, 623 patients provided data about their condition, including Dermatology Life Quality Index (DLQI; range 0-30) and Work Productivity and Activity Index (WPAI; range 0-100) measures. All patients provided informed consent prior to completing self-reported questionnaires.

Results: 284 patients (44.7% male; mean age 41.0 years) with physician-reported current disease severity assessment of mild and 554 patients (45.7% male; mean age 39.5 years) with

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moderate AD were analyzed. Characteristics for mild and moderate AD, respectively: mean BSA, 11% and 15%; mean EASI scores, 5.4 and 8.8; head and neck lesions, 36% and 38%; physician-reported chronic AD, 81% and 84%. Outside of an acute episode, mild and moderate patients experienced a mean of 3.5 and 4.7 symptoms day-to-day, respectively, of which daily itch (87% and 96%), daily dry skin (93% and 94%), and daily cracking/raw skin (44% and 67%) were most common. 80% and 68% of mild and moderate patients, respectively, experienced acute episodes with or without day-to-day symptoms, with 31% and 47% patients, respectively, currently experiencing an episode. Mild and moderate patients were receiving 2.4 and 2.6 AD therapies on average, respectively. For 70% of moderate patients, current therapies did not result in overall severity rating improving, consistent with the physician's belief that better control could be achieved in 56% of moderate patients (and 34% of mild patients). Mean DLQI was 4.7 for mild and 6.8 for moderate patients, and corresponding WPAI scores were 13.3 and 19.9.

Conclusion: Adult AD patients experiencing clinically mild AD experienced poorly controlled symptoms, HRQoL impairment, and impact on daily life. The burden of mild AD was generally similar to moderate AD, but in some cases, was worse for moderate patients. Based on physician and patient data, multiple unmet needs remain, and more can be done to improve disease control in adults experiencing mild and moderate AD.

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Session-Board # - 4-052

Poster Title: Preliminary evaluation of addition of transgender patient care into a doctorate of pharmacy curriculum

Poster Type: Descriptive Report

Submission Category: Clinical Topics / Therapeutics

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Purpose: The number of transgender and gender diverse patients seeking care in the United States is increasing. For many, pharmacotherapy is a part of their gender transition. Current literature on instructional methods about this patient population's social and medical considerations is lacking. The purpose of this study is to evaluate students' perceived usefulness of the individual components of the curriculum to identify the most effective instructional methods and also the effect of this instruction on changing students' confidence to provide competent care to individuals who are transgender.

Methods: Course material encompassing cultural, empathetic and medical considerations for people who are transgender was added to a third-year course in a doctorate of pharmacy curriculum. The materials included a pre-class video and handout, in-class jeopardy game, viewing and discussion of a story about a patient who is transgender, a student gender identity exploration exercise, a panel of people who identify as transgender, and patient cases. An online survey was conducted to assess students' confidence before and after the intervention. Students were also asked to rate how helpful each component of instruction was in changing their confidence to provide competent care to individuals who are transgender. A Mann-Whitney U Test was performed to calculate statistical significance for the change in student confidence.

Results: Student confidence to provide competent care to patients who are transgender increased significantly following the intervention. The median confidence level among students

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increased from 4/10 to 7/10 ($p < 0.01$). Students rated the pre-class video, jeopardy game, and patient panel as the most helpful components of instruction.

Conclusion: Inclusion of materials on transgender pharmacy care showed improvement in students' perceived confidence in caring for transgender patients. The panel discussion was reported as the most helpful component and could be considered for incorporation in other pharmacy school curriculums.

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Session-Board # - 4-053

Poster Title: Effect of patiromer on serum potassium in hyperkalemic patients with severe chronic kidney disease on RAAS inhibitors: results from OPAL-HK and AMETHYST-DN

Poster Type: Evaluative Study

Submission Category: Clinical Topics / Therapeutics

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Purpose: Hyperkalemia (HK) is common in patients with chronic kidney disease (CKD), especially those on inhibitors of the renin-angiotensin-aldosterone system (RAASi), and may result in arrhythmias and death. Normalizing serum potassium levels is important, regardless of CKD severity. Patiromer is a sodium-free, nonabsorbed potassium binder indicated for the treatment of HK in the U.S. and E.U. In this analysis, we evaluated the pooled efficacy and safety of patiromer in patients across CKD stages 3 to 5, based on estimated glomerular filtration rate (eGFR) at baseline, enrolled in two previously published clinical trials of patiromer.

Methods: OPAL-HK (NEJM 2015) was a 12-week, 2-part (Part A, treatment; Part B, randomized withdrawal), single-blind study of 243 patients; AMETHYST-DN (JAMA, 2015) was a 52-week, randomized, open-label study of 304 patients. Eligible patients were on one or more RAASi and, in AMETHYST-DN, had Type 2 diabetes mellitus. For study entry, patients had to have an eGFR of 15 to 59 mL per min per 1.73 meters squared by local lab at screening; due to study designs, it was possible for patients to have eGFR by central lab that was less than 15 (or greater than 59) at baseline. Entry serum potassium (mEq per L) ranged from 5.1 to less than 6.5 (OPAL-HK) and greater than 5.0 to less than 6.0 (AMETHYST-DN). All patients were on stable doses of one or more RAASi at baseline and during the studies. Patiromer total daily starting doses were 8.4 to 16.8 g (OPAL-HK) and 8.4 to 33.6 g (AMETHYST-DN), given divided twice daily. In this post hoc analysis, efficacy data were pooled to determine the change from baseline in serum potassium during the first 4 weeks of patiromer treatment (primary endpoint in both studies)

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by baseline central lab eGFR (mL per min per 1.73 meters squared) subgroups (less than 15, 15 to less than 30, and 30 or greater).

Results: This analysis included 21, 167, and 347 patients with eGFR less than 15, 15 to less than 30, and 30 or greater, respectively. Baseline characteristics were mean (SD) age 62 (10), 65 (10), and 66 (9) years; percent male 57, 64, and 59; mean (SD) potassium 5.62 (0.46), 5.50 (0.41), and 5.36 (0.42) mEq per L; and mean (SD) eGFR 11.7 (2.2), 22.9 (4.2), and 48.2 (14.0) mL per min per 1.73 meters squared, respectively. Mean (SD) total daily prescribed patiomer doses during the first 4 weeks of treatment were 17.6 (8.1) g, 20.1 (8.0) g, and 19.6 (7.8) g, respectively. By week 4, mean (95 percent CI) serum potassium (mEq per L) change from baseline was -1.28 (-1.64, -0.92) (eGFR less than 15), -0.89 (-0.98, -0.81) (eGFR 15 to less than 30), and -0.80 (-0.85, -0.76) (eGFR 30 or greater). The proportion of patients with serum potassium 3.8 to less than 5.1 mEq per L at week 4 was greater than 82 percent across eGFR subgroups. Two to 5 percent of patients discontinued patiomer due to related AEs across subgroups. Gastrointestinal AEs were predominantly mild or moderate in severity.

Conclusion: Serum potassium reductions were consistent across eGFR subgroups, which suggests that patiomer was effective in treating hyperkalemia in patients regardless of CKD stage. The reduction in potassium and tolerability were consistent with previously published data in the patiomer clinical trial program.

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Session-Board # - 4-054

Poster Title: Benzodiazepines safety and effectiveness in alcohol withdrawal management in medical ward

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Benzodiazepines (BDZs) are the first line therapy for alcohol withdrawal management, mainly diazepam, chlordiazepoxide, lorazepam, and others. We hypothesized that Benzodiazepines (BDZs) are not well utilized in the management of alcohol withdrawal in the second major general hospital in Qatar. Clinical institutes withdrawal assessment scale for alcohol (CIWA-Ar) for the symptom-triggered approach using BDZs is not applied, and fixed BDZs dosing approach is not standardized. Assessing BDZs prescribing practices will help to provide safe and effective medication therapy thus reducing duration and cost of hospitalization.

Methods: Medication use evaluation (MUE) of BDZs in AW patients admitted with AW to the Internal Medicine wards between May 2016 to September 2017. A retrospective chart review of pre-identified patient electronic health records by two pharmacists approved by the hospital pharmacy research committee. We used descriptive statistics to analyze and present BDZs utilization data and patients' demographics using Microsoft Excel. The primary outcome was the average duration of BDZs treatment for AW. And the secondary outcomes were mean cumulative BDZs dose, use of adjunctive medications for AW management, the incidence of AW complications, the occurrence of serious adverse outcomes of benzodiazepine treatment, concomitant disease conditions secondary to alcohol and nurses' assessment documentation.

Results: A total of 78 admissions, 38 patients met the inclusion criteria. Three patients had recurrent hospitalizations which made the total included admissions number is 42. The average duration of benzodiazepine was four days, and the mean cumulative BDZs dose was 71 mg. A

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total of 11 patients (26%) required the use of adjunctive medications like phenytoin and haloperidol. The incidence of AW complications experienced by the patients ranged from requiring the use of restrains, psychiatry consultation, one-to-one nursing and delirium tremens. BDZs adverse outcomes found in one case of non-arousable sedation and four cases of deep sedation that required holding the scheduled dose of BDZs. Most of the admission (74%) had at least one appropriate nurse documentation indicating BDZs administration due to detected AW symptoms.

Conclusion: BDZs use led to considerable improvement in AW patients. Results of this review indicate that there is a need for standardizing BDZs prescribing and administration using a protocol to optimize AW management. A larger cohort study is needed to statically assess overall BDZs safety and effectiveness.

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Session-Board # - 4-055

Poster Title: The impact of adherence to antidiabetic medications on the Quality of life (QoL) of diabetic patients in Dmmam Saudi Arabia

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: The purpose of this abstract is to measure the level of adherence for diabetic patients; measure the HRQoL of diabetic patients; evaluate the impact of sociodemographic factors on both adherence and HRQoL and assess the impact of adherence to anti-diabetic on HRQoL of diabetic patients.

Methods: A cross-sectional study using two types of a validated structured questionnaire: 1. GMAS to identify patients adherence to antidiabetic drugs , .2. EQ5D to measure the QoL The Participants were recruited at KFUH and PHCs from October to Jun 2018. Descriptive statistics were used to describe demographic and disease characteristics of the patients. Percentages and frequencies were used for the categorical variables, while means or medians and standard deviations or inter quartile ranges were calculated for the continuous variables. The association of level of medication adherence on HRQoL was assessed using three approaches: 1). Using chi-square test where EQ-5D health states were divided into three categories (perfect health indicates no problem in domains of EQ-5D; slight/moderate indicates problems in some domains but not worse than moderate health in any domains; severe/unable indicates a health status with problems worse than moderate health in some domains). 2). Using a multiple logistic regression where the response variable (EQ-5D index) was modelled as a binary variable indicating 'perfect health' (1.000) or 'imperfect health' (<1.000). 3). Using a multiple linear regression where the dependent variable, EQ-5D index was transformed using a cubic function to achieve normally distributed residuals. A p-value less than 0.05 was considered as statistically significant. All analyses were carried out using SPSS Statistics 24.0.

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Results: Among the 189 participants, half of them were male, 79% were older than 50 years, more than 50% had education of high school or more, and more than half of them had monthly income of 5000sar or more. Regarding the clinical characteristics of the participants, 78% had comorbidity conditions, 61% were on oral anti-diabetic medications only and 70% were on multiple anti-diabetic medications. 48% of participants had random glucose level of 200 or more, and 10% had previously admitted to a hospital due to diabetes. The results show that 19%, 21% and 23% of patients had maintained the low medication adherence. In overall, 43% (81/189) participants had maintained high medication adherence, and only 22% (41/189) had maintained the low medication adherence to anti-diabetic drugs. Among the respondents, 88%, 51%, 50%, 43% and 31% were agreed as having no problem in terms of self-care, anxiety or depression, usual activities, mobility, and pain or discomfort respectively. Five participants did not respond to some domains. one-fifth of patients had no problem in any domains of EQ-5D half of participants (95/184) reported as having problems in some domains but not worse than moderate health in any domains (called 'slight-moderate health state')

Conclusion: Patients found to be generally highly adhere towards their antidiabetic medications. Age is one of the socio-demographic factors which was directly proportionate with adherence level. In contrast, random blood glucose was inversely proportionate to the level of adherence.

- The findings indicate that gender, monthly income, number of comorbidities, and random blood glucose level are strongly associated with the perfect health state of diabetic patients. In general a weak correlation between medication adherence and HRQoL

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Session-Board # - 4-056

Poster Title: Proton pump inhibitors utilization and hospital acquired Clostridium difficile infections in a community teaching hospital

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: The use of Proton Pump Inhibitors (PPIs) in clinical practice has greatly modified the prevention and treatment of acid-related gastrointestinal diseases. Although highly efficacious, inappropriate usage and long-term use of PPIs has been associated with increased hospital mortality as well as development of hospital acquired Clostridium difficile infection (HA-CDI). The objective of this study was to assess the appropriate utilization rate of PPIs and occurrence of HA-CDI when PPIs were initiated at a community teaching hospital.

Methods: The Institutional Review Board has approved this study. Medical records of adult patients, 18 years of age and older, who were discharged under the hospitalist service were retrospectively reviewed for the time-period of June 1, 2017 to September 30, 2017. Patients included in the study must have been administered at least one dose of a PPI during their hospitalization. Exclusion criteria consisted of patients with a home medication list in-progress or missing, patients with documentation of PPIs on the home medication list, or subsequent admissions for re-admitted patients during the study period. The primary outcomes included the number of patients with appropriate documented indications for PPIs initiated during hospitalization as well as indication at discharge if applicable. The secondary outcome was the number of HA-CDI cases when PPIs were ordered during hospitalization. Additionally, a subset analysis for the HA-CDI cases determined the percentage of patients ordered antibiotics along with antibiotic classification.

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Results: After reviewing 2,028 medical records of patients discharged under the hospitalist service, 223 patients were reviewed for primary and secondary outcomes. For the primary outcome of PPIs that were initiated during hospitalization, 84 patients had appropriate documented indications, 65 patients had inappropriate documented indications, and 74 patients had no documented indications for PPIs. For the other primary outcome of continuation of PPIs at discharge, there were 43 patients with appropriate documented indications, 9 patients with inappropriate documented indications, 36 patients with no documented indications, and 3 patients with no discharge note. For the secondary outcome, there were three cases of HA-CDI during the study period. All three cases of HA-CDI received concomitant antibiotics, which included fluoroquinolones and cephalosporins.

Conclusion: This study observed that 62.3% of patients who met inclusion criteria did not have an appropriate indication documented or had missing documentation. Based on this study, no clear association can be made between PPI use and HA-CDI. In conclusion, this study illustrates over-prescribing of PPIs in a community teaching hospital.

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Session-Board # - 4-057

Poster Title: Retrospective evaluation and tracing of heparin infusion protocol use in a community hospital (RETRO-HEP)

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: The Institute of Safe Medication Practices recognizes heparin as a high-alert medication. Correspondingly, The Joint Commission emphasizes anticoagulation safety in its National Patient Safety Goals. To help improve the safety of anticoagulant use, our institution utilizes a standardized protocol for ordering, monitoring, and dose-adjusting intravenous (IV) heparin, with an option for physician-directed dosing. The purpose of this study is to evaluate the use of the heparin protocol.

Methods: This is a retrospective chart review conducted using the hospital's electronic health record (EHR). Patients were included if they were at least 18 years of age and were on a continuous heparin infusion between July 2017 and January 2018. Heparin orders received in the emergency department were excluded from this study. Data collected includes patient demographics, weight, past medical history, heparin dose and indication, and hematology and coagulation panels. The primary outcome was mean time to first therapeutic partial thromboplastin time (PTT) and mean time to 2 consecutive therapeutic PTTs. Secondary outcomes were percent of patients who achieved therapeutic PTT, percent of patients who achieved 2 consecutive therapeutic PTTs, documented adverse bleeding events, and overall adherence to protocol.

Results: The study included 285 patients. Mean time to first therapeutic PTT was 17 (SD=14.12) hours and mean time to 2 consecutive therapeutic PTTs was 28 (SD=17.04) hours. Among the

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orders evaluated, 83 percent (236/285) utilized weight-based (WB) dosing and 17 percent (48/285) utilized physician-directed (PD) dosing. Therapeutic PTT was achieved in 79 percent (226/285) of patients. Two consecutive therapeutic PTTs were achieved in 57 percent (168/285) of patients. Adverse bleeding events were documented in 1 percent (4/285) of patients. Overall adherence to protocol was observed in 11 percent (31/285) of patients. The greatest area of non-adherence was “PTT every 6 hours,” however average time between PTTs was approximately 7.29 (SD=3.03) hours.

Conclusion: The study identified areas of non-adherence to the protocol, which may warrant further evaluation. Based on the study results, a multidisciplinary committee has been formed to re-evaluate the protocol

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Session-Board # - 4-058

Poster Title: Evaluation of the prophylactic use of proton pump inhibitors in hospital settings

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Proton pump inhibitors (PPIs) are effective for various diseases but are tremendously overprescribed in different settings. They are the main stay of therapy both in the management of acute and chronic ulcers. PPIs are often utilized with drugs or disease states that are associated with increased risk of ulcer development. The aim of the study was to evaluate the appropriate use of PPIs as a prophylactic measure in different population and disease states. The study also targets to evaluate whether PPIs are adequately prescribed for patients on Non-Steroidal drugs Anti-Inflammatory Drugs (NSAIDs).

Methods: We conducted a retrospective multicenter observational study in five different Lebanese university hospitals from October 2017 to May 2018. Inclusion criteria were patients admitted to the following hospitals and were prescribed either prophylactic PPI or Non-Steroidal drugs (NSAIDs). Exclusion criteria were patients on PPI as a treatment modality. A total number of 115 patients met the inclusion criteria and enrolled in the study. The primary endpoint was evaluation of the appropriate use of prophylactic PPI regimen in terms of dose, indication, and duration in reference to American Society of Health System Pharmacist (ASHP). The secondary outcome was to evaluate the appropriate use of PPI in patients prescribed NSAIDs. Data collected included dose and duration of PPI use, previous medical history, present medications, and risk factors. The Institutional Review Board (IRB) of the involved centers approved the study design. Data was analyzed by the SPSS version 22.0 and presented as frequency/percentage and mean $\pm$ standard deviation (SD) to illustrate current prescribing practices.

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Results: Among 127 patients were screened for appropriate use for proton pump inhibitors, 97 patients were given PPI as prophylaxis measures, Patients demographics were similar including gender (54.6% females, 45.4% males) as well as co-morbidities and urban vs. rural area (59.8% vs 40.2%) respectively. Omeprazole was the most prescribed PPI (43.3%) followed by Pantoprazole (39.2%) followed by others (17.5%). We assessed appropriateness based on several factors including if the administration for prophylaxis as indicated according to ASHP risk factors criteria, in addition the dose and duration for prophylaxis used, although anticoagulation and administration of antibiotics were not statistically significant, but represented with high percentage as misleading indication for PPI use (63.9 %, $P=0.061$) and (73.2%, $P=0.905$) respectively. But the results overall showed inappropriateness with statistically significant P value <0.01 .

Conclusion: This study highlights the gaps evident in overprescribing PPIs in Lebanese hospitals. Patients were increasingly treated for longer duration than recommended by clinical guidelines and mainly with higher doses. This raises the need for continuous educational programs targeted to all hospitals in different medical services to orient them about the international recommendations for PPI proper utilization. The role of clinical pharmacist may facilitate this process across all patients through interventions that should be implemented to raise the awareness.

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Session-Board # - 4-059

Poster Title: Potentially inappropriate medication prescribing in elderly patients with chronic kidney disease: an observational study

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Potentially inappropriate medication (PIM) is defined as a drug carrying risks outweighing the expected clinical benefits, especially when there is evidence for an equally effective and safer alternative medication. Safe medication prescribing in elderly patients is a significant health problem, and patients with chronic kidney disease (CKD) are particularly at higher risk of drug-related toxicities due to changes in pharmacokinetics and pharmacodynamics. In Lebanon, limited data are available on the prevalence of PIM. This study was carried out to examine the extent of PIM prescription in elderly patients with CKD and to identify the implicated drugs and risk factors.

Methods: A retrospective data analysis of patients with CKD above the age of 65 years was carried out on inpatients admitted between January 2016 and January 2017 at two University Teaching Hospitals in Beirut, Lebanon. Out of 1073 CKD patients screened, only 137 met the inclusion criteria. Patients were excluded if their age was less than 65 years, and if chart data was missing. PIMs were identified using the modified Beers' criteria in patients with renal impairment using creatinine clearance calculated by the Cockcroft–Gault formula. We used chi square and multiple logistic regression analysis to determine which patient characteristics were associated with prescription of PIMs.

Results: Of the 137 patients, the average age was 76.39 years. Females accounted for 54% of the sample. The mean serum creatinine was 4.30 mg/dl and the mean BUN was 69.20 mg/dl. The mean eGFR was 18.74 ml/min/1.73 m². A total of 74 out of the 137 patients had a PIM prescribed with prevalence rate of 54.01%. A total of 563 medications were prescribed among

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the 137 patients with an average four medications per patient (range 1–9). Overall, 57% (322/563) of all medications prescribed were potentially inappropriate.

Histamine-2 receptor antagonists accounted for 42.54% (137/322) of the total PIMs with ranitidine representing the most commonly prescribed medication. Anticoagulants accounted for the next largest category of PIMs with 34.16% (110/322) followed by anticonvulsants 10.55% (34/322) of total PIMs. The opioid analgesic tramadol accounted for 8.69% of PIMs. PIM prescriptions were less likely if the patient was in stage G4 CKD {adjusted odds ratio (AOR): 0.11 [95% confidence interval (CI): 0.09–1.46]} and if admitted to the intensive care unit [AOR: 0.31 (95% CI, 0.14–0.67)]. PIM prescriptions were more likely if the patient was female [AOR: 1.62 (95% CI, 1.11–2.35)] and if the reason for hospital admission was non-renal disease [AOR: 1.69 (95% CI, 0.95–3.00)].

Conclusion: PIMs were prescribed for more than half of elderly CKD patients in this study. This confirms that physicians are not aware of PIMs, which increases drug-related problems. Increasing awareness on PIMs in Lebanese hospitals might reduce the frequency of PIM prescriptions.

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Session-Board # - 4-060

Poster Title: Review of oral anticoagulant use in a community hospital

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: The Joint Commission National Patient Safety Goals emphasize the need to improve the safe use of medications and highlight the goal to reduce harm associated with anticoagulant therapy. Trends in prescribing have shifted toward an increased utilization of the direct oral anticoagulants over the more traditional oral anticoagulant, warfarin. This emphasizes the need to develop institutional guidelines for the direct oral anticoagulants to encourage optimal use. This study's objective is to assess appropriateness of direct oral anticoagulant utilization in an inpatient setting.

Methods: This was a medication use evaluation assessing use of apixaban, dabigatran, and rivaroxaban. A retrospective chart review was conducted using the institution's electronic medical record. This study was exempt by the institutional review board. Patients were included if they were 18 years of age or older, admitted to the institution from August to December 2017, and received at least one dose of a study medication. Patients admitted to the maternity unit were excluded. A report of eligible patients was generated and data collected included patient demographics, initial dosing, dose adjustments, renal function, weight, concomitant medications, timing of switching between anticoagulants, timing of perioperative anticoagulant management, bleeding events, and thrombotic events. Appropriateness was based on comparisons to approved labeling, tertiary references, guidelines, and peer reviewed literature. The primary endpoint was the incidence of overall appropriateness of direct oral anticoagulants utilization during a patient's hospital stay. This was a composite endpoint encompassing dosing, transitioning to or from other anticoagulants, and timing of

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anticoagulants around procedures. Secondary endpoints included the incidences of recorded bleeding events, related thrombotic events, and aforementioned individual factors that encompass the primary endpoint. Descriptive statistics were used to analyze the results.

Results: Three hundred and thirty two patients were included. The most commonly used direct acting oral anticoagulant was apixaban (68.37 percent), followed by rivaroxaban (24.96 percent) and dabigatran (7.53 percent). Overall, 63.86 percent (212/332) of direct acting oral anticoagulant use was considered completely appropriate. Of the total instances of inappropriate use (n=140), a majority was due to inappropriate transitions to or from other anticoagulants (44.29 percent), followed by dosing (28.57 percent) and periprocedural management (27.14 percent). Parenteral anticoagulants were inappropriately transitioned to a direct acting oral anticoagulant 57.41 percent (62/108) of the time. There were 21 cases where a parenteral anticoagulant overlapped with direct acting oral anticoagulant. A direct acting oral anticoagulant was inappropriately held prior to and restarted after a procedure 54.29 percent (19/35) of the time and 45.24 percent (19/42) of the time, respectively. Inappropriate renal dose adjustment made up a majority of the instances of inappropriate dosing at 70 percent (28/40), followed by indication (22.5 percent, 9/40) and drug interactions (7.5 percent, 3/40). Rivaroxaban had the highest rate of inappropriate renal dose adjustment (15 percent, 12/80) compared to dabigatran (8 percent, 2/25) and apixaban (6.17 percent, 14/227). There were 17 instances of bleeding and no instances of thrombosis.

Conclusion: Though the direct acting oral anticoagulants were managed appropriately in a majority of instances, higher rates of suboptimal utilization were seen when transitioning from a parenteral anticoagulant to a direct oral anticoagulant and during periprocedural management of anticoagulation. Further analysis on the gaps in workflow contributory to these major findings is required. Such analysis will guide development and implementation of a prescriber order set and clinical pathway.

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Session-Board # - 4-061

Poster Title: Prevalence and clinical consequences of contraindicated repaglinide-gemfibrozil interaction in an ambulatory setting

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Concomitant use of repaglinide with gemfibrozil may increase in repaglinide exposure, with an elevated risk of hypoglycemia. The European Medicinal Products Evaluation Agency contraindicated the concomitant use of these two drugs in 2003 according to 5 reports of serious hypoglycemic episodes in patients using them at the same time. This drug-drug interaction alert was implemented into computerized physician order entry system in 2004 at a medical center. However, prescriptions involving these two drugs are still prescribed recently. This study aimed to investigate the prevalence of repaglinide-gemfibrozil interaction, physicians' responses to the interaction alerts, and the clinical consequences of concomitant use.

Methods: A retrospective observational study was performed using a computerized ambulatory prescription database and information from an alert and logging system in a tertiary care medical center in Taiwan. Prescriptions involving repaglinide or gemfibrozil through 2007 to 2014 were included. We manually reviewed all alert and confirmed any individual changes of prescriptions in response to the alert by comparing alert prescriptions logged, final prescriptions, and medication history. Furthermore, we conducted a case series study based on reviews of electronic medical charts. We collected blood glucose data and related information about patients who concomitant use of repaglinide and gemfibrozil at the same medical center from January 2007 to September 2015.

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Results: During the 8-year study period, 101,422 prescriptions involving repaglinide or gemfibrozil were prescribed for 9,197 patients. A total of 61 (0.66%, 61/9,197) patients received 332 prescriptions with repaglinide-gemfibrozil interaction. Of these, 310 alerts for 44 (72.1%, 44/61) patients were overridden. In response to alerts, the daily dose of gemfibrozil was reduced in 2 prescriptions (0.64%, 2/310) with override alert. Among the 22 prescriptions with accepted alerts, gemfibrozil was shifted to another lipid-lower drug in 9 (40.9%, 9/22), repaglinide was shifted to another oral antidiabetic drug in 8 (36.4%, 8/22) and gemfibrozil or repaglinide was canceled in 5 (22.7%, 5/22). A total of 48 patients used repaglinide and gemfibrozil concomitantly. Over the entire 14,198-day observation time, 8 patients with 20 hypoglycemic events (1.41 events/1,000 patient-days) were detected.

Conclusion: Medical prescriptions involving contraindicated repaglinide-gemfibrozil interaction are not rare in clinical practice. Physicians usually overrode the contraindicated drug-drug interaction alerts. Exposure of these contraindicated drug-drug interaction would certainly result in hypoglycemia. Concomitant use of repaglinide and gemfibrozil should be avoided to ensure drug safety.

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Session-Board # - 4-062

Poster Title: Characterizing patients initiating abaloparatide, teriparatide, or denosumab in a real-world setting: a US linked claims and EMR database analysis

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: To identify and characterize patients initiating treatment with abaloparatide (ABL), teriparatide (TPTD), or denosumab (DMAB) in a real-world setting.

Methods: A proprietary data portal containing electronic medical records (EMR) and links to medical and pharmacy claims was used to identify patients new to treatment with ABL, TPTD, or DMAB. The OM1 Data Cloud covers approximately 200 million patients in the US with claims and includes over 35 million patients with linked claims and EMR data. Patients ≥ 18 years of age at index date and a prescription or fill of one or more of ABL, TPTD or DMAB were included. The index date was defined as the date of the initial prescription or fill for ABL, TPTD or DMAB; between May 1, 2017 and May 7, 2018 (the identification period). New/recent users were defined as patients with no recorded treatment with the same drug in the 12 months prior to index date.

Results: Overall, 2411 ABL, 8613 TPTD, and 83115 DMAB patients were new to therapy in the identification period. The median duration of pre-index historical data per patient in the study cohort was 4.47 years. Mean age ($\pm$ standard deviation, SD) for ABL, TPTD, and DMAB cohorts, respectively, was 69.6 (10.57), 69.3 (11.09), and 72.1 (10.18), with a greater proportion being females (95.3%, 86.7%, and 91.6%; $p < 0.001$). Overall, the most prevalent comorbid conditions were osteoarthritis (46.1%), gastrointestinal disorders (45.6%), type 2 diabetes (19.8%), and respiratory diseases (COPD: 19.7% and asthma: 12.5%). Both ABL- and TPTD- treated patients

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had lower mean comorbidity score as assessed by the Charlson Comorbidity Index compared to DMAB-treated patients, with 33%, 36%, and 45% of ABL, TPTD, and DMAB patients, respectively, having a score of ≥ 2 ($p < 0.001$). Overall, 17.4%, 2.2% and 20.0% of patients received bisphosphonate(s), selective estrogen receptor modulators, or other osteoporosis medications prior to treatment initiation. Additionally, 45.8% of all patients had exposure to glucocorticoids prior to their index date (46.5%, 50.8%, 45.2% for ABL-, TPTD- and DMAB-treated patients respectively; $p < 0.001$) with 16.0% currently on glucocorticoids (12.6%, 19.6%, and 15.8% for ABL-, TPTD- and DMAB- treated patients respectively; $p < 0.001$).

Conclusion: Patients initiating ABL, TPTD, and DMAB showed some differences in clinical and demographic characteristics and comorbidities prior to treatment initiation.

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Session-Board # - 4-063

Poster Title: The impact of implementation of a medication algorithm for drug-naïve patients with type 2 diabetes mellitus in an academic teaching hospital in Japan.

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Unlike guidelines from the American Diabetes Association, Japanese clinical guidelines do not state which anti-diabetic agents should be used as first line therapy. Although metformin exhibits better HbA1c-lowering effects than dipeptidyl peptidase-4 (DPP-4) inhibitors, DPP-4 inhibitors are often prescribed for patients newly diagnosed with type 2 diabetes mellitus (T2DM) in Japan because of the low incidence of side effects. Moreover, several studies have reported that metformin has been underused. This study examined the prescribing patterns of oral hypoglycemic agents (OHA) in drug-naïve patients with T2DM, as well as the impact of implementation of a medication algorithm.

Methods: The study was approved by the Institutional Review Board of Kitasato University Hospital (KUH), Japan. We first conducted a retrospective chart review of drug-naïve patients with T2DM at KUH between January 1 and December 31, 2016. Patients older than 20 years who started oral hypoglycemic monotherapy were included in the study. Data was collected from electric medical records. A medication algorithm was then developed by an endocrinologist and a pharmacist. Medications included in the algorithm were sitagliptin, teneligliptin, and metformin. To examine the impact of implementation of the algorithm, we simulated patients enrolled in the retrospective chart review to see if using the algorithm would change the selection of initial therapy and influence drug costs. Inclusion criteria for the algorithm were: HbA1c between 6.5 and 10.0 percent, negative test result for urine ketone, and patients not to be initiated on insulin therapy. Patients lacking an initial HbA1c value and results

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of renal and liver function tests were excluded. Patients were categorized into metformin therapy if they did not meet the following exclusion criteria: patients older than 75 years old, dialysis patients, creatine value greater than or equal to 1.3 mg/dL for males and 1.2 mg/dL for females, and medical conditions for which metformin is contraindicated. Patients excluded from metformin therapy were categorized into sitagliptin or teneligliptin therapy depending on their estimated glomerular filtration rate (eGFR).

Results: A total of 63 patients who started oral hypoglycemic monotherapy were enrolled into the study (mean age: 64.2 ± 14.0 years; 61.9 percent males, 38.1 percent females; mean BMI: 26.7 ± 8.3 kg/m²; mean HbA1c: 7.7 ± 1.0 percent). The proportion of patients with eGFR greater than 50 mL/min/1.73 m² was 92.1 percent. Of the 63 patients, 45 (71.4 percent) were on DPP-4 inhibitors, 8 (12.7 percent) were on sodium glucose cotransporter-2 (SGLT2) inhibitors, and 7 (11.1 percent) were on biguanides (metformin). Of the patients prescribed DPP-4 inhibitors, 19 (42.2 percent) were prescribed sitagliptin, 13 (28.9 percent) were prescribed teneligliptin, 6 (13.3 percent) were prescribed linagliptin, 6 (13.3 percent) were prescribed saxagliptin, and 1 (2.2 percent) was prescribed vildagliptin. As a result of simulating 63 patients using the algorithm, 27 (42.9 percent) were changed from other OHA to metformin, 19 (30.2 percent) were changed from other OHA to sitagliptin, and 17 (27.0 percent) exhibited no change of therapy. No patients were categorized using teneligliptin. The difference of monthly drug cost per patient between pre- and post-utilization of the algorithm was -4,359 Japanese yen (JPY) (-3,501 – -5,658) by switching from OHA to metformin, and -279 JPY (-1,260 – -3,948) by switching from OHA to sitagliptin.

Conclusion: By retrospective chart review, 71.4 percent of drug-naïve patients started on DPP-4 inhibitors, while 11.1 percent started on metformin. When selecting an initial therapy based on the algorithm, approximately 70 percent of the initial therapy would change and more than 50 percent of patients could be treated by metformin. Although teneligliptin does not require dosage adjustment based on the degree of renal impairment, it is more expensive than other DPP-4 inhibitors; therefore, sitagliptin is recommended for patients without severe renal impairment. The results of the simulation showed that using the algorithm could promote appropriate initial therapy and reduce drug costs.

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Session-Board # - 4-064

Poster Title: Multi-faceted effects of SGLT2 inhibitor in diabetic patients with metabolic liver disease

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Nonalcoholic fatty liver disease (NAFLD) / nonalcoholic steatohepatitis (NASH) are caused by overeating and lack of exercise. They accompany obesity, dyslipidemia, and hyperinsulinemia, and affected patients are very likely to suffer from other diseases such as diabetes. Drug therapy encompasses agents for lifestyle diseases accompanied by NAFLD/NASH, such as diabetes and dyslipidemia, no definitive drug therapy has yet been established. On the other hand, SGLT2 inhibitors are expected to be therapeutically effective for NAFLD patients with concomitant diabetes. In conducting clinical research on NAFLD/NASH, we have examined the multiple effects of SGLT2 inhibitors in diabetic patients with metabolic liver diseases.

Methods: This retrospective study's protocol was approved by the ethics committee of Kochi University Medical School. We extracted 71 patients with type2 diabetes with metabolic chronic liver disease who started treatment with SGLT2 inhibitor at Kochi Medical School Hospital could continue taking more than 3 months between August 2014 and January 2018 based on medical charts. We extracted sex, age, diabetes history, presence or absence of fatty liver from the medical charts as the background of the patient. In addition, the presence or absence of concomitant medications, clinical laboratory data were retrospectively extracted from medical charts. In addition, changes of HbA1c, body weight, and ALT from the start of SGLT2 inhibitor administration to 3 months after administration were calculated, and

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correlations between changes of HbA1c and body weight, HbA1c and ALT, body weight and ALT were examined by determining the correlation coefficient, respectively.

In order to investigate the influence of the type of concomitant drug, we conducted multivariate analysis as explanatory variables of no combination drug, insulin preparation, sulfonylurea (SU), DPP4 inhibitor (DPP4I), GLP-1 receptor agonist (GLP-1), thiazolidine (TZD), as objective variables of HbA1c, body weight and ALT improvement.

Results: HbA1c, body weight and BMI significantly decreased from 1 month after administration compared to baseline. In liver function, ALT, AST, γ GTP and FIB-4 index were significantly decreased 3 months after administration. No correlation was found between HbA1c and body weight change, ALT and weight change in each correlation, but a positive correlation was found between ALT and HbA1c change. The effect of concomitant medications was not a significant explanatory variable for the presence or absence and type of concomitant medication against any effects of hypoglycemic depression, weight loss and ALT improvement.

Conclusion: It was suggested that there is a correlation between liver function improving action and hypoglycemic action. On the other hand, liver function improving effect of SGLT2 inhibitor is generally thought to be involved in weight loss by drugs, but liver function improving action may not correlate with weight loss. In this study, the correlation between hypoglycemic effect and liver function improvement effect suggested improvement of liver function by hyperglycemia and insulin resistance improvement.

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Session-Board # - 4-065

Poster Title: Interaction between paclitaxel and clopidogrel: relevance in clinical practice

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Paclitaxel is mainly eliminated by CYP2C8 in the liver, which is strongly inhibited by the clopidogrel metabolite acyl- β -D-glucuronide. This can lead to increased paclitaxel toxicity. The aim of the study is to assess the clinical relevance of the interaction between Paclitaxel and Clopidogrel.

Methods: A retrospective observational study was performed between January 2014 and April 2018 in a tertiary hospital. All patients who were administered a combination of paclitaxel and clopidogrel were included. To identify the patients who were treated with both drugs, the electronic medical record and the chemotherapy database were checked. In order to assess the clinical relevance of the interaction, age, regimen, paclitaxel dose, cumulative paclitaxel dose, blood tests (Hb, neutrophil count, platelets, etc), ECOG performance status and any adverse events identified by the physician were extracted from the clinical records prior and subsequent to the combined administration of clopidogrel and paclitaxel. The incidence of adverse events (AE) was analysed according to the criteria NCI-CTCAE, including the discontinuation rate due to AE. These rates were compared with AEs' frequency described on Paclitaxel' SPC.

Results: Seven patients were treated with paclitaxel and clopidogrel concomitantly, with a mean age of 65 years old and ECOG performance status of 1. The therapeutic regimens used were carboplatin+paclitaxel 50 mg/m² weekly (n=2), carboplatin+paclitaxel every 3 weeks (n=2, dosing at 175 mg/m² and 200 mg/m²) and paclitaxel 100 mg/m² weekly (n=3). Each patient

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was administered 7 cycles, with an average cumulative dose of 1036 mg of paclitaxel. The only drug used that could influence CYP2C8 was clopidogrel. Blood cell counts at baseline were normal for all the patients.

According to clinical implications, three patients experienced neutropenia and leucopenia (43% during the study period vs 28% on the SPC), only one grade 3. One patient developed thrombocytopenia and six anemia (14% and 64% during the study period vs 11% and 86% on the SPC, respectively).

None of the patients required treatment discontinuation due to AEs, neither reduce paclitaxel dose or skip/postpone a course of treatment. According to the physician's evaluation, hematological toxicity (of any grade) was developed in 100% of the cases, but none experienced peripheral sensory neuropathy (0% vs 25-85% according to the SPC). The ECOG performance status changed during co-administration only in one case, worsening from 1 to 2.

Conclusion: Drug-drug interaction between clopidogrel and paclitaxel was not associated with a clinically relevant increased risk of neuropathy or neutropenia, according to the low rate of AE observed during the study period. Nevertheless, further research is needed due to study limitations (interindividual variability, different regimens and doses of paclitaxel used and few patients analysed).

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Session-Board # - 4-066

Poster Title: Medication utilization evaluation and prescribing patterns of direct oral anticoagulants

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Direct oral anticoagulants (DOACs) are approved for prevention of thrombosis in both nonvalvular atrial fibrillation (NVAf) and venous thromboembolism (VTE). In Lebanon, Dabigatran was introduced in 2011, followed by rivaroxaban in 2013 and apixaban in 2016. These agents offer some advantages compared to warfarin such as lack of routine monitoring of anticoagulant effect and fewer drug-drug interactions but their use is subject to challenges including lack of clinical experience. Studies evaluating the use of DOAC's are lacking in Lebanon, therefore we conducted this medication utilization evaluation (MUE) to determine the appropriateness of DOACs use and their prescribing patterns.

Methods: We conducted a cross-sectional descriptive study in community pharmacies and in one outpatient department of a university hospital in Beirut, Lebanon, from January to April 2018. Patients who presented to the community pharmacies or the outpatient department were included in the study if they were taking any of dabigatran, rivaroxaban or apixaban. After receiving an oral informed consent, we gathered socio-demographic information, self-reported medical history and concurrent medication use. In addition, patients were asked about the source of the prescribed DOAC, perceived or documented indication of use, dosing regimen including dose, frequency, duration of use and administration with respect to meals. Appropriate indication was based on the Food and Drug Administration (FDA) approved indications, while appropriate dosing regimen was defined in relation with the indication of use and according to the FDA's recommendations. Drug-Drug interactions were identified.

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Statistical analysis was conducted using SPSS version 22.0. Descriptive analyses were reported as mean $\pm$ standard deviation (SD) for quantitative variables or frequency and percentage for categorical variables. To determine factors associated with appropriateness of use, chi-square and Fisher exact tests were used when applicable as well as logistic regression models. A P-value of 0.05 was considered statistically significant. The institutional review board at the Lebanese International University approved the study.

Results: A total of 115 patients were included. The mean $\pm$ SD age was 71 ± 10.51 years and 66 (57.4%) were males. The most common indication was stroke prophylaxis in NVAf (61.7%), of whom, 67 (94.4%) had a high risk of stroke seen by CHA₂DS₂-VASc score ≥ 2 and 45 (63.4%) had a low risk of bleeding shown by ATRIA score less than 4. Among all patients, 47 (41%) were self-payers, 43 (39%) had their medications covered by the National Social Security Fund (NSSF) and 23 (20%) by private insurance. Rivaroxaban was the most commonly prescribed DOAC (56.5%), followed by dabigatran and apixaban (33% and 10.5% of patients respectively). Inappropriate indication, duration, and dose/frequency were seen in 10.4%, 20.9% and 42.6% of the patients, respectively. At least one inappropriate criterion was encountered in 68 (59.1%) patients. The most appropriate criterion was administration of DOAC with respect to time and meals (96.5% and 92.17% respectively). There was no statistical difference between patients' characteristics and choice of the DOAC. Multivariable analysis found that medication cost coverage was associated with appropriate DOAC use; patients having coverage were less likely to use DOAC inappropriately than self-payers (adjusted OR 0.26; 95% CI 0.091 – 0.737; $p=0.011$).

Conclusion: This MUE revealed that in a convenient sample of patients receiving DOACs, there was an overall appropriate use with regards to indication, duration and administration. Inappropriateness was mostly seen in the dose and frequency. More than half of the encounters had at least one inappropriate criterion, suggesting that quality improvement efforts should be implemented to improve the appropriate use of DOACs; such as providing thorough patient education at the time of DOAC initiation and improved prescriber education regarding recommended dosing and duration.

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Session-Board # - 4-067

Poster Title: Case control study about the risk of pancreatic cancer with dipeptidyl peptidase-4 inhibitors (DPP4I) in Lebanon

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Pancreatic cancer is one of the deadliest malignancies worldwide. Risk factors associated with this disease are long-term diabetes and smoking. Since, the risk of pancreatic cancer associated with incretin based therapies is controversial, we conducted this study to evaluate the risk of this type of cancer with dipeptidyl peptidase-4 (DPP-4) inhibitors that are relatively a new class of oral antidiabetic medications.

Methods: A retrospective case-control study was conducted between January and April 2018 among Lebanese diabetic patients. The Institutional Review Board of the Lebanese International University approved the study protocol in December 2017. Recently diagnosed pancreatic cancer cases were recruited from multiple hospitals across Lebanon while controls from hospitals and clinics in a 1:4 ratio. Patients with any type of cancer that has metastasized to the pancreas or those who were on a DPP4-inhibitor for less than one year were not included in the study. Pre-established questionnaires were then filled via a medical chart review covering patient demographics, comorbidities, laboratory values and medications. Bivariate and multivariable analyses were conducted to assess the relationship between DPP4-inhibitors and pancreatic cancer while adjusting for potential confounders. A p-value less than 0.05 was deemed statistically significant.

Results: The study included 625 patients of whom 125 cases (mean age 67.9 ± 11.1 years) and 500 controls (mean age 61.8 ± 30.2 years). The bivariate analysis identified multiple significant

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differences between cases and controls, cases being less physically active, less dyslipidemic, more hypertensive, and had a longer history of diabetes. The multivariable analysis showed a statistically significant association between pancreatic cancer risk and the following factors: physical activity [adjusted odd's ratio (aOR)=0.37], hypertension (aOR=2.28), dyslipidemia (aOR=0.46), history of diabetes (aOR=1.12), DPP4-inhibitors (aOR=0.33), insulin therapy (aOR=4.38) and sodium-glucose co-transporter-2 inhibitors (aOR=0.14). The odds of pancreatic cancer were higher with rapid acting (aOR=7.56) than long acting (aOR=2.95) insulin and lower with vildagliptin (aOR=0.16) than sitagliptin (aOR=0.53).

Conclusion: This case control study suggests a protective association between DPP4-inhibitors and pancreatic cancer, particularly with vildagliptin. It further emphasizes the increased prevalence of pancreatic cancer with insulin therapy. Larger prospective studies should be conducted to allow generalization of the results.

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Session-Board # - 4-068

Poster Title: Cost savings initiatives for infliximab use in a county hospital system

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Infliximab is an anti-TNF-alpha inhibitor indicated for the treatment of numerous autoimmune diseases such as Crohn's disease, Ulcerative Colitis and Rheumatoid arthritis. It was added to a county health system formulary over a decade ago restricted to a prior-authorization program in an effort to control cost. It is restricted to Rheumatology, Gastroenterology, Dermatology and Neurology services. The hospital system implemented a dose rounding protocol to reduce waste when utilizing agents such as infliximab. Infliximab purchases are approximately 2 million dollars annually despite these cost savings initiatives. A review was conducted to evaluate appropriate use and adherence to the current guidelines.

Methods: A retrospective electronic chart review was conducted on one hundred and ninety patients receiving Infliximab from January 2016 to May 2017. An inpatient and outpatient utilization report for infliximab for this time frame was obtained from the internal Information Systems department. The report characteristics included the patient's demographics, indication for use, physician specialty, dose, adverse drug reaction, prior therapy, TB test status, prior authorization approval and efficacy.

Results: One hundred and ninety patients were reviewed, forty-five percent (85/190) were male and fifty-five percent (105/190) were female. The average age of the patients was 44 years of age. Thirty-eight percent (72/190) of the prescribers were rheumatology; fifty-five percent gastroenterology, five percent (10/190) dermatology and two percent (3/190) neurology. The top indications were Crohn's disease, Ulcerative colitis and Rheumatoid Arthritis. The adverse reactions included bacterial infection, active TB or TB reinfection, respiratory infection, abdominal pain and hypersensitivity reactions. Prior therapy for the

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dermatology indications included topical steroids, adalimumab and methotrexate at sixty percent each among other agents. Azathioprine and mesalamine were the top two prior agents for gastroenterology indications. Patients most often failed methotrexate, adalimumab and etanercept prior to infliximab therapy for rheumatology indications. Mycophenolate and methotrexate were the only prior agents failed for neurology indications. The reasons for infliximab discontinuation were pregnancy, death, ADE, antibodies, non-compliance, TB, HCV treatment, loss of insurance or ineffectiveness. Seventy-nine percent of the patients showed efficacy with infliximab therapy. Compliance with the prior authorization criteria was one hundred percent while compliance with the dose rounding protocol was only fifty-six percent.

Conclusion: Infliximab remains a top purchase for a county health system although cost savings measures have been employed. The review revealed that there is complete compliance with the prior authorization guidelines. The Pharmacy and Therapeutics Committee and Medical Executive Board approved using step-therapy with a trial of adalimumab for up to 12 weeks for appropriate indications. The biosimilar, Infliximab-dyyb was added to the formulary with the original infliximab being the last choice for use. There is a potential annual cost savings of 400,000 dollars with the biosimilar switch and additional cost savings with adalimumab use.

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Session-Board # - 4-069

Poster Title: Curtailing the use of high risk medications in the elderly at a county health system

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: High-Risk Medications (HRMS) are identified by the Centers for Medicare & Medicaid Services (CMS) as having a higher safety risk in individuals 65 years of age or older. They may cause orthostatic hypotension leading to falls, decline in drug clearance or heart anomalies. There are 12,676 patients 65 years of age or older in a county health system. A review was conducted to identify all patients in this age range who were dispensed one or more HRMS within the system. Ultimately the goal is to enhance safety by decreasing the number of HRMS dispensed to this patient population.

Methods: An outpatient utilization report from August 2017 to April 2018 and an inpatient utilization report from August 2017 to January 2018 were obtained from the internal Information Systems department. The report characteristics included patient demographics, high risk medication received, dispensing location, authorizing physician, alternative medications. The unit cost of the high risk medication as well as the formulary alternative was obtained from the wholesaler.

Results: There were two thousand six hundred and twenty-five outpatients and one thousand three hundred and eighty-nine inpatients 65 years of age or older who received a HRM within their respective time frames. There were twenty-nine different HRMS dispensed from two thousand nine hundred and eleven outpatient prescriptions. The highest number of outpatient HRM prescriptions dispensed during this time period from one location was seven hundred and eleven and the lowest was fifteen. Nineteen percent of the outpatients were on one HRM, two percent were on two different HRMS and less than one percent was on greater than two HRMS during the same time frame. The top five HRMS dispensed in the outpatient setting were

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cyclobenzaprine, hydroxyzine, nitrofurantoin, meclizine and amitriptyline. There were twenty-eight different HRMS dispensed to inpatients from four thousand one hundred and ninety seven units dispensed during that time frame. Nine percent of the inpatients were on one HRM and one percent was on two different HRMS. Less than one percent of inpatients were on greater than two different HRMS. The top five HRMS dispensed in the inpatient area were digoxin, diphenhydramine, ketorolac, methocarbamol and promethazine.

Conclusion: The use of HRMS in patients 65 years of age and older in many cases cannot be avoided; however decreasing their exposure to the elderly can substantially improve safety. Each of the high risk medications have a safer alternative available and the cost associated with this shift is negligible to the health system. It was recommended to add an HRM alert to the electronic health record with all of the available alternatives to assist physicians. The physician can then select an alternative if they deem it appropriate for their patient.

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Session-Board # - 4-070

Poster Title: Retrospective study investigating the adherence to guidelines in using albumin for inpatients in Lebanese hospitals

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Albumin is an expensive drug which imposes relatively additional load on the health care system if used inappropriately. Pharmacists play an important role in drug utilization reviews, where they can improve the quality of care for patients by preventing inappropriate use of medication, preventing adverse reactions of drugs, improving the overall effectiveness of the drugs, and decreasing unnecessary medication costs. Hence, the present study aimed to evaluate the pattern of albumin use (indication, frequency, and duration) and adherence to guidelines for inpatients in Lebanese hospitals. Secondary objective was to determine additional health cost of albumin when used inappropriately.

Methods: This is a six months observational retrospective hospital-based research on drug utilization. The study was conducted in five different hospital sites in urban (Beirut: Three sites) and rural (north and south: one site each) regions in Lebanon. Researchers obtained institutional review board approval from the centers included in the study. Hospital records were scanned from January 2017 till January 2018 to include all patients (eighteen years or older) that have received albumin during their hospital admission. Patients with albumin hypersensitivity, severe anemia, or at risk of volume overload were excluded. A data collection sheet was used to assess various factors about knowledge, practice and adherence to albumin guidelines. It was composed of four fields (patient demographics, admission details, albumin utilization, and laboratory parameters) and filled by the investigators at each site. Data was analyzed using statistical package for social science (SPSS) version 22. Means, standard

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deviations, percentages and p values were used. For all analysis, significance was set at P less than 0.05.

Results: A total of 193 patients with mean age 64.1 ± 19.1 years were included. Albumin was mainly prescribed in the intensive care unit (ICU) with 75.1 percent. Seventy four percent of the patients received albumin appropriately for its indication and only 26 percent had inappropriate use. Among the latter, malnutrition was the most prevalent reason for albumin misuse (78 percent) and the adherence to guideline was significantly lower in malnutrition versus other indications (P less than 0.001). Mean serum albumin was $2.5 \text{ g/dL} \pm 0.6$; and a strong correlation was noted between adherence to guidelines and albumin blood levels (P less than 0.001). Higher adherence was present significantly in the intensive care unit (ICU) versus other units (P equals 0.034). Also, albumin blood levels significantly differed before and after albumin administration (P less than 0.001). For cirrhosis patients, the duration of albumin use was 52 percent matching with guidelines. The cost of inappropriate albumin utilization was insignificant (P equals 0.629).

Conclusion: The findings of this study revealed that the percentage of inappropriate utilization of albumin should be taken into consideration in Lebanese hospitals. Thus, to enhance the appropriate use of albumin and to minimize any possible additional cost on public health, it is essential to set guideline standards within each hospital and to maintain continuous awareness among all healthcare team personnel about the importance of adequate drug utilization concerning indication, frequency and duration.

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Session-Board # - 4-071

Poster Title: Assessment of adherence to restrictive guidelines for conivaptan administration at a community hospital

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Conivaptan, a vasopressin antagonist typically utilized as a second line treatment for euvolemic or hypervolemic hyponatremia, has historically been listed in the top ten most costly medications utilized in the intensive care unit (ICU) at our institution. Due to this medication's high cost, restrictive guidelines were created to judiciously utilize this medication. The purpose of this study is to assess utilization of conivaptan and to review adherence to restrictive guidelines.

Methods: This retrospective chart review included all adult patients admitted to the ICU who were administered conivaptan from January 2015 through December 2016. Established restrictive guidelines for conivaptan approval at order entry included admission into the ICU, severe hyponatremia (defined as serum sodium less than 120 millimoles per liter), and symptoms attributed to hyponatremia not responsive to other standard therapies (such as free water restriction, furosemide diuresis, saline infusion or demeclocycline). Primary endpoint was the percentage of conivaptan orders in compliance with the restriction criteria. Selected data collected included days of conivaptan therapy, urine osmolarity, urine sodium concentration, serum sodium concentration at initiation of conivaptan use, listed hyponatremia diagnosis, hyponatremia symptoms, and therapy prior to conivaptan administration. Descriptive statistics were used for analysis.

Results: During the two-year time frame 23 patients were administered conivaptan and all patients were followed by a nephrologist. Three patients (13 percent) met the defined restrictive criteria for severe hyponatremia with symptoms, and treatment failure with other therapies. In addition, of those receiving conivaptan and not meeting restriction criteria, 80 percent (16 out of 20) had no symptoms documented in the medical record, 40 percent (8 out

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of 20) had serum sodium greater than 119 millimoles per liter, and 15 percent (3 out of 20) had no inpatient treatment for their hyponatremia prior to conivaptan administration. A cost savings of approximately \$25,000 could have been actualized if restriction criteria were followed during this time frame.

Conclusion: This study demonstrated the need for physician and pharmacist adherence to established restriction criteria for conivaptan administration.

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Session-Board # - 4-072

Poster Title: Shortage-related requests received by a drug information center: a descriptive analysis of affected drugs and resources supporting recommendations for management

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Drug shortages remain a significant problem in healthcare, and present challenges in their management to ensure optimal patient care. The University of Illinois at Chicago (UIC) Drug Information Group (DIG) is a fee-for-service drug information center that accepts drug information requests from client hospitals and health systems throughout the United States. A number of requests are related to drug shortage management. The purpose of our study is to characterize the shortage-related requests received by our center, describe the management recommendations provided, and identify useful drug information resources for pharmacists seeking guidance on management of drug shortages.

Methods: Data on requests received by the UIC DIG between 2013 and 2016 were collected electronically. Text-mining functions in Microsoft Excel identified presumably shortage-related requests to be screened, and manual review identified those confirmed to be shortage-related. Descriptive analyses were performed to report frequencies of requests for each drug and American Hospital Formulary Service (AHFS) drug class, requests receiving recommendations for shortage management, types of recommendations, and information resources supporting these recommendations.

Results: A total of 151 shortage-related drug information requests were identified. Most requests occurred in 2013 (43.0%; n=65) and decreased in number in 2014 (23.2%; n=35), 2015 (21.9%; n=33), and 2016 (11.9%; n=18). Most requests were related to AHFS classes of electrolyte, caloric, and water balance agents (15.2%; n=23); autonomic drugs (12.6%; n=19);

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and cardiovascular drugs (11.9%; n=18). Within these categories, the drugs most frequently affected were, respectively, sodium chloride (n=8), phentolamine (n=10), and papaverine (n=8). A recommendation was provided for 81.5% of requests (n=123), among which the most frequent was use of an alternative drug (76.4%; n=94). Recommendations were informed by 15 different informational resource categories and were mostly derived from primary literature (60.2%; n=74) and the American Society of Health-System Pharmacists (ASHP) Drug Shortages website (41.5%; n=51).

Conclusion: Requests for drug shortages received by a nationally-serving drug information center were most commonly related to drug classes of electrolyte, autonomic, and cardiovascular agents, which may predominantly affect critically ill and surgical populations. A majority of shortage-related requests were recommended to be managed by using an alternative agent. The identified decrease in shortage-related requests over time may not necessarily reflect national drug shortage trends, and should be further explored. Numerous drug information resources supported recommendations for shortage management; thus, pharmacists may benefit from a more comprehensive resource providing shortage-specific guidance.

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Session-Board # - 4-073

Poster Title: Patterns of prescribing neuropathic pain drugs in the Lebanese community: a cross-sectional study

Poster Type: Descriptive Report

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Neuropathic pain is a common chronic pain condition that can be challenging to treat, because of the heterogeneity of its etiologies, symptoms and underlying mechanisms. It is defined as pain arising as a direct consequence of a lesion or disease affecting the somatosensory system. Drugs to treat neuropathic pain are highly prescribed; however, limited data exist on the rates and patterns of use in Lebanon. This study was conducted to evaluate the patterns of prescribing neuropathic pain drugs in the Lebanese community pharmacies and their associated adverse effects.

Methods: This is an observational study that was conducted at 30 community pharmacies across all Lebanese governorates between January and May 2018. Adult patients diagnosed with neuropathic pain disorder were included in the study. Data was collected by interview questionnaire. The parameters evaluated were demographic profile of patients, geographic information, past medical history, type of neuropathic pain disorder and drug data (number of medications used, drug classes, doses, physicians' specialty, duration of treatment and its monthly cost). Pain description was evaluated according to Short-Form McGill Pain Questionnaire (SF-MPQ).

Results: Three hundred and sixty patients were included in this study of whom 55 percent were females. Most patients diagnosed with neuropathic pain disorders resided in the age group of 40-49 years (25.3 percent). The most common neuropathic pain disorder encountered was cervical or lumbar radiculopathy (42.8 percent) followed by diabetic neuropathy (26.1 percent), spinal cord injury (13.9 percent) and post herpetic neuralgia (9.4 percent). Twenty-three

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percent of patients used monotherapy of which antiepileptics were the most frequently prescribed class (87 percent). Seventy-seven percent of patients used combinations of two or more drugs, with pregabalin plus nonsteroidal anti-inflammatory drugs the most frequently identified. The prescribing physicians were primarily orthopedics (36.7 percent), followed by neurologists (16.1 percent), endocrinologists (15.6 percent), whereas 16.5 percent of patients used drugs without a prescription. Post-herpetic neuralgia was the major etiology treated without a prescription (40 percent of cases). Thirty-six percent had been taking the drug for less than six months. Among those using neuropathic pain drugs, 31.7 percent increased the dose with time. Eighty percent reported having experienced adverse effects. The most common reported adverse effect was sedation (40.6 percent) followed by weight gain (31.7 percent).

Conclusion: Pregabalin is first line treatment of neuropathic pain disorders in Lebanon. Polytherapy is usually needed to alleviate neuropathic pain and improve patients' quality of life, however, it was associated with higher risk of adverse events versus monotherapy.

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Session-Board # - 4-074

Poster Title: Validity of utilization and efficacy of teriparatide prescription

Poster Type: Evaluative Study

Submission Category: Drug Information/Drug Use Evaluation

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Purpose: Owing to the recent emergence of rapidly-aging society, the number of patients with osteoporosis and osteoporotic fracture have sharply increased. Accordingly, among various drugs, teriparatide, a unique synthetic anabolic agent of parathyroid hormone, has been utilized after the drug was proved for reimbursement by Korea National Health Insurance Program since December, 2016. This study attempts to examine the appropriateness of drug utilization in this hospital by the reimbursement criteria, set forth by Health Insurance Review and Assessment. It also makes an assessment of the therapeutic efficacy by measuring the bone mineral density (BMD) before and after administration of teriparatide.

Methods: This retrospective study, utilizing the electronic health record, evaluated 281 patients who had been prescribed for teriparatide at this hospital from March 2013 to December 2017. First, patients who had been administered with teriparatide at this hospital were evaluated for the appropriateness of age, disease name and prescription duration. Then, the efficacies of treatment were assessed by comparing bone mineral densities (BMDs) and T-scores before and after the administration of teriparatide.

Results: The reimbursement criteria for teriparatide are sixty-five years or older, two or more osteoporotic fractures and a T-score of BMD test of -2.5 or less. The assessment of the appropriateness of teriparatide administration showed that 18 out of 281 patients were inappropriately prescribed due to their ages being less than 65 years. A total of 118 patients was properly prescribed, satisfying the reimbursement criteria regarding osteoporosis or

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osteoporotic fractures. The mean duration of teriparatide administration was 3 months, which met the less-than-24-months criteria of Health Insurance Review and Assessment. The assessment of treatment effect of teriparatide was carried out by making an analysis of BMD change after teriparatide administration. The results of lumbar tests showed that 21 out of 24 patients had an increased BMD; One patient showed no change; and a BMD decrease was observed in 2 patients. Regarding the proximal femur, among 24 subjects, 19 showed a BMD increase, while 5 revealed a BMD decrease despite teriparatide treatment. The lumbar showed a mean BMD increase of $0.12 \pm 0.15 \text{ g/cm}^2$ (17.3%), while the proximal femur revealed a mean BMD increase of $0.05 \pm 0.07 \text{ g/cm}^2$ (13.6%). BMD increase was apparent in both the proximal femur and lumbar regions.

Conclusion: The significant therapeutic effect of teriparatide could be verified by this investigation. This study was able to establish the necessity of (1) attaining and accurate pharmacologic indication by conducting timely BMD tests before and after teriparatide administration, and of (2) this synthetic parathyroid agent administration for an adequate duration. Furthermore, this investigation has developed a basis for the management system for monitoring adverse reactions of patients administered with teriparatide, which necessitates an intervention by pharmacists.

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Session-Board # - 4-075

Poster Title: Impact of antimicrobial stewardship on appropriate initiation of antibiotic therapy

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: The aim of the study was to evaluate the impact of the antimicrobial stewardship program (ASP) in the improvement of appropriate antibiotic prescribing at a major hospital in Saudi Arabia using selected antimicrobial stewardship quality indicators.

Methods: A pilot study was conducted to evaluate ASP where it was noticed fluctuation in adherence to the appropriate adherence to antibiotic therapy standards. Over 6 month period (from September 2017 to February 2018) we randomly reviewed 854 medication orders of emergency, critical care and general surgical and medical patients receiving antibiotic therapy. Adherence to the selected antimicrobial stewardship quality indicators was prospectively observed to evaluate appropriate initiation criteria for antibiotic therapy (start date visible, stop date visible, indication shown, appropriate specimen obtained prior to therapy initiation, and the patient prescribed the right antibiotic dose to be administered at the right intervals).

Results: Considering the documentation of the start date of therapy initiation we reached 100% compliance; however, variations were noticed on the documentation of the antibiotic therapy duration. There was improvement noticed on last two months (January 66.9% and February 57%). The indication for the antibiotic therapy was shown only on 49% of the orders reviewed at the beginning (September); however gradually increased to reach 66% on February. Collection of specimens for culture and sensitivity at the time of initiating empirical therapy reached in 93% of the cases by February although started with a percentage of 59% on September. About 93% patients in average received the antibiotic dose at the right interval.

Conclusion: The study concluded that having an antimicrobial stewardship program (ASP) in the hospital improves the appropriate prescribing of antibiotics and collaboration with all

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healthcare professional can further influence the effectiveness of the an antibiotic stewardship team. The antimicrobial stewardship quality indicators were improving overtime. Strategies were implemented to improve adherence to ASP. These include requiring authorisation, educational program, feedback and continuous communications with prescribers and nurses. Further evaluative studies are required to evaluate the effectiveness of these strategies on the ASP. ASP software was suggested to overseeing the realtime overall use of antimicrobials in the hospital.

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Session-Board # - 4-076

Poster Title: Evaluation of *Acinetobacter baumannii* pneumonia among critically ill patients in a tertiary care hospital in Saudi Arabia

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: *Acinetobacter baumannii* (*A.baumannii*) has been identified as one of the most common pathogens of nosocomial pneumonia. Throughout the time, this bacterium has undergone significant taxonomic alterations leading to high antimicrobial resistance compared with other organisms. A study in U.S. showed that among patients with *A.baumannii* infections, the multi drug resistance- *A.baumannii* was more than 80%. The purpose of this study is to evaluate the used therapy, length of hospital stay and mortality rate of pneumonia caused by *A.baumannii* among critically ill patients at a tertiary care hospital in Saudi Arabia.

Methods: This is retrospective chart review study conducted over one year, between January 2017 and to Dec 2017. Institutional review board approved this study. Patient information collected from medical charts. All patients admitted to the intensive care unit (ICU) with pneumonia infection caused by *A. baumannii* were included. Immunocompromised patients were excluded. The primary outcome is to specify the most common antibiotic used to treat *A.baumannii* pneumonia infection. Secondary outcomes are to evaluate the risk factors predispose the patients to *A.baumannii* pneumonia and report the mortality rate of *A.baumannii* pneumonia infection among ICU patients at our institution.

Results: There were 71 patients included in the study with a mean age of 55 years old. Of those patients, 65% were males. The mean length of stay was 55 days. The most sensitive agent was tigecycline (63%). Other tested antibiotics at our institution were all under 20% of sensitivity,

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our institution however does not test for colistimethate sodium sensitivity. Colistimethate sodium was the most used agent (55%) for such infections, colistimethate sodium combination therapy was used in 42% of the patients compared to 13% as monotherapy. The most identified risk factor for *A.baumannii* pneumonia in our ICU patients were use of antibiotics in the past 90 days (84%) and mechanical ventilation (73%). Most of the patients died before resolution their infections (55%), the 14-day mortality rate was 46.15%.

Conclusion: This study demonstrates the poor outcomes associated with pneumonia infection caused by *A.baumannii* among ICU patients. Further improvement should be considered including implementing antimicrobial stewardship and wise use of broad spectrum antibiotics. Further studies should be done to assess such implementations and its relationship to patient outcomes.

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Session-Board # - 4-077

Poster Title: Impact of implementing a pharmacist driven intervention antimicrobial stewardship report in the incidence of healthcare associated clostridium difficile infections

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Clostridium difficile infections (CDI) in hospitalized patients are known to be closely related to antibiotic exposure. Moreover, CDI increases mortality rates and economic burden. As medication experts, pharmacists have become essential in the surveillance of antibiotics to help optimize antibiotic therapy and reduce adverse effects. Our institution implemented a stewardship report using the Infectious Diseases Society of America (IDSA) Antibiotic Stewardship Program recommendations in order to improve antibiotic utilization. The objective of this study was to evaluate the effect of ASP Epic Report (AER) guided pharmacist interventions on local healthcare associated C. difficile infection rates and other healthcare use outcomes.

Methods: A pharmacist driven antibiotic stewardship service was initiated at our facility in November 2016. It involved daily pharmacist review of the stewardship alerts generated by the ASP EPIC report (AER) that flagged potential patients eligible for an intervention based on 5 categories 1) target organism, 2) bug drug mismatch, 3) de escalation 4) drug lab mismatch 4) duplicate coverage 6) protected antimicrobial. Our study time period was from September 2015 to July 2017. The pre intervention time period was from September 2015 to October 2016 and and the post intervention time period from November 2016 to July 2017. Primary outcome was the the percent of HA CDIs at our facility pre and post stewardship report guided interventions. Secondary outcomes were length of stay and number of days on antibiotics. Chi square and independent t test were used to compare outcomes across pre and post time periods. An alpha level of five percent was used for all of the comparisons.

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Results: In the pre intervention group there were 52.9 percentage females and 47.1 percentage males compared to 54.9 percentage vs. 45.1 percentage in the post intervention group respectively (p equal 0.269). The mean age was 66 versus 67.2 yo (p equal 0.461) for the pre and post groups respectively. In the prior to the AER, there were 16 cases of HA CDI in the 1059 ASP patient's intervened. In the post AER, there were 24 HA CDIs cases amongst the 2316 ASP intervened patients. The percent of HA CDI was decreased from 1.5 percentage to 1 percentage (p equals 0.235). The mean length of stay in the pre and post implementation of the AER was 13.22 versus 10.52 days (mean difference minus 2.695, p less than 0.005) respectively. The mean number of days on antibiotics in the pre and post AER implementation was 9.604 versus 8.209 (mean difference minus 1.3954, p less than 0.005).

Conclusion: Pharmacist interventions resulted in a non statistical reduction of 0.5 percentage in HA CDIs, but may be extrapolated to an annual 1,450,000 dollars in medical cost avoidance. Furthermore, there was a significant reduction in the number of antibiotic days and length of stay that may amount to a cost savings over 3,000 dollars per patient admission. Pharmacist led interventions play a crucial role in successful antimicrobial stewardship programs and significantly influence appropriate antibiotic prescribing habits, improved quality of care and produce savings.

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Session-Board # - 4-078

Poster Title: Duration of therapy in community-acquired pneumonia (CAP) and the role of procalcitonin

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: In an effort to decrease the duration of therapy and unnecessary use of antimicrobial agents, procalcitonin was made available at our institution. Procalcitonin is a serum biomarker highly specific to non-localized bacterial infections. It offers aid in diagnoses of lower respiratory tract infections (LRTIs), when clinical uncertainty prevails. This study was aimed to determine the length of stay and overall duration of therapy for patients admitted with community-acquired pneumonia (CAP), and to identify whether procalcitonin had played a role.

Methods: A list of all antibiotics orders for patients admitted from January to April of 2018 with an ICD-10 code of J18.9 for pneumonia was obtained. Patients admitted from another hospital, long-term care, or nursing facility were excluded to limit population sample to community-onset. Subjects were categorized into those with discharge prescriptions (DCP) for antibiotics (n equals 178) and those without (n equals 239). Inpatient length of stay (LOS) was used as the inpatient length of therapy (LOT), added to the day supply of the prescriptions to determine total LOT for those discharged on antibiotics. For those without DCP, the LOT was determined using the medication administration records. Orders for procalcitonin (PCT) and respiratory panels (RP) were reviewed. RP was determined to guide duration of therapy (DOT) if positive results led to early discontinuation of antibiotics, or if negative panels led to termination of atypical coverage. PCT was classified as guiding DOT if levels less than 0.25 ng/ml were not followed by discharge prescriptions, or led to a decrease in inpatient DOT.

Results: Mean duration of total therapy was determined to be greater than 7 days in patients discharged with prescriptions for antibiotics, and greater than 4 days in those without. Orders

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for procalcitonin (n equals 302) were determined to guide DOT in less than 15 percent of all cases. There were 66 orders for continuation of antibiotics upon discharge, despite corresponding PCT levels falling below 0.25 ng/mL; of which 25 were below <0.10 ng/mL. 81 instances of DCP were identified where PCT was ordered at some point during the length of inpatient stay, but not within 24 hours prior to discharge. Respiratory panels (n equals 214) were determined to guide duration of therapy more often than PCT in both groups.

Conclusion: Lack of consistency in interpretation of PCT levels were frequently observed across the population pool, raising concerns with regards to cost and benefit to overall patient care. These findings may suggest a need to increase prescriber education and utilization of effective antimicrobial stewardship practices. Pharmacists have a potential to offer aid in antibiotic decision making and increasing appropriate interpretation of serum biomarkers.

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Session-Board # - 4-079

Poster Title: Implementation of an antimicrobial stewardship prospective audit strategy in a critical access hospital

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Current regulatory requirements for critical access hospitals (CAHs) include The Joint Commission Antimicrobial Stewardship Medication Management Standard MM.09.01.01 and the state of California antimicrobial stewardship requirements. A recent survey found that less than 50% of CAHs had implemented all 7 of the Centers for Disease Control and Prevention (CDC) Core Elements of Hospital Antimicrobial Stewardship Programs (ASPs). Implementation of ASPs in CAHs pose unique challenges, including limited resources. Investigators sought to assess the impact of a pharmacist prospective audit strategy within a CAH on antimicrobial stewardship interventions and CDC Core Element compliance.

Methods: This was a single center, retrospective study assessing pharmacist interventions related to antimicrobial stewardship before (Jan17-Mar17) and after (Apr17-Mar18) implementation of a prospective audit strategy. The antimicrobial stewardship committee devised a plan to enhance stewardship services within the CAH which included appointing a pharmacist to provide drug expertise, guidance regarding tracking and reporting, and to lead a prospective audit strategy. The development and education phase (Nov16-Mar17) included pharmacy staff training and education which consisted of 12-hours of continuing education focused on antimicrobial stewardship as well as development and implementation of a patient tracking form and intervention tracking system. Pharmacist interventions were performed 7 days a week during pharmacy operating hours and focused on the following: therapeutic duplication, de-escalation, dose optimization (e.g., renal dose adjustment), therapy initiation or escalation, and intravenous to oral conversion. To determine the impact of the intervention, antimicrobial interventions per 1000 patient days and intervention acceptance rates were

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collected pre and post implementation. CDC Core Element compliance was assessed before (Sep 2016) and after the intervention (Mar 2018).

Results: Post-implementation, there was a 635% and 52% increase in antimicrobial interventions per 1000 patient days (50.5 from 6.9) and intervention acceptance rates (76% from 50%), respectively. Compliance with the CDC's Core Elements of Hospital Antimicrobial Stewardship Programs increased from 29% to 100% after appointing a lead pharmacist and implementing the prospective audit strategy.

Conclusion: Implementation of a lead pharmacist and a pharmacist-led prospective audit strategy in a CAH resulted in enhanced compliance with the CDC's Core Elements for Hospital Antimicrobial Stewardship Programs, increased antimicrobial interventions per 1000 patient days, and enhanced intervention acceptance rates.

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Session-Board # - 4-080

Poster Title: Impact of an antimicrobial stewardship-focused advanced pharmacy practice experience (APPE) on a vancomycin drug monitoring service

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: The two pharmacy schools in Puerto Rico graduate less than 100 pharmacists annually. Although only certain hospitals may employ a full-time clinical pharmacist, the hospitals that do are expected to include Antimicrobial Stewardship Program (ASP) initiatives in their clinical workload. To fulfill the practice obligation to train future pharmacists in this area, and provide this pharmacy service offering at the facility, the clinical pharmacist of a secondary care hospital developed the first ASP APPE available in the public pharmacy school of Puerto Rico. This report describes the impact of an ASP APPE on pharmacy interventions associated with vancomycin drug monitoring.

Methods: Collaborating with the School of Pharmacy, University of Puerto Rico, a clinical pharmacist developed the first ASP APPE. Implemented in a secondary care hospital in 2017, the rotation included student training and responsibilities in pharmacokinetic evaluation, renal dose adjustment, antibiogram development, culture and sensitivity results evaluation, rounds with infectious disease physician, and shadowing or active participation on the Pharmacy and Therapeutic, Infection Control and ASP Committees. The students reviewed all patients on vancomycin. The vancomycin drug monitoring service consisted of evaluating dose per protocol (based on weight and renal function), determining the need for a trough or basic metabolic panel, evaluation of renal function, trough result evaluation, recommendation of a new dose based on pharmacokinetic calculation, and evaluation of culture results. After clinical review with the preceptor, the student provided recommendations to the physician. All vancomycin monitoring-related interventions were documented in the pharmacy record. To evaluate the impact of these recommendations, data collected included patient demographics; renal function; allergies; diagnosis; dose per protocol (based on weight and renal function); and the number, types and acceptance rates of recommendations made to physicians.

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Results: From July 2017 through December 2017, five students participated in the ASP APPE. There were 247 adult patients evaluated. The demographics were: 51 percent female, 55 percent between 18-64 years old and 45 percent more than 64 years old. A total of 280 vancomycin monitoring-related interventions were documented in the six-month period before the implementation of the ASP APPE, while 741 vancomycin monitoring-related interventions were documented during the first six months of the APPE; this represents an intervention increase of 164 percent. A total of 173 troughs and 112 basic metabolic panels were identified as needed and ordered by the clinical pharmacist per protocol. A total of 61 pharmacy recommendations were made with 62 percent (38/61) acceptance. These pharmacy recommendations were: three for dose reduction based on trough level and pharmacokinetic calculation with 100 percent (3/3) acceptance; 43 for dose increases based on trough level and pharmacokinetic calculation with 51 percent (22/43) acceptance; five therapy change based on culture results with 100 percent (5/5) acceptance; three for de-escalation with 67 percent (2/3) acceptance, five discontinuations with 80 percent (4/5) acceptance, one escalation with 100 percent (1/1) acceptance and one initiation of and additional antibiotic with 100 percent (1/1) acceptance.

Conclusion: Pharmacy students can make a difference in the fulfillment of an institution's ASP strategies as was demonstrated with the increase in drug monitoring and related interventions. In addition, pharmacy students have an opportunity to gain exposure to real-world pharmacy experiences and interest in hospital pharmacy as a potential career choice.

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Session-Board # - 4-081

Poster Title: Risk of acute kidney injury in patients on concomitant vancomycin and piperacillin-tazobactam compared to those on vancomycin and cefepime at a community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: The most common empiric antibiotic regimen administered for coverage of methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa* includes vancomycin and an antipseudomonal beta-lactam, usually either piperacillin-tazobactam or cefepime. Some studies suggest vancomycin and piperacillin-tazobactam may be associated with higher rates of nephrotoxicity, compared with vancomycin and cefepime. Well-controlled, adequately-powered studies comparing rates of acute kidney injury (AKI) are lacking and available evidence is often conflicting. This research project seeks to investigate the incidence of AKI in patients receiving the combination of piperacillin-tazobactam and vancomycin versus the combination of cefepime and vancomycin in a community hospital setting.

Methods: This retrospective cohort study was conducted at College Medical Center, a 221-bed community-based teaching hospital located in Long Beach, California. From January 1, 2015 until December 31, 2017, the occurrence rates of AKI were analyzed and compared in acute care patients who met the inclusion criteria and received either a combination therapy of vancomycin and piperacillin-tazobactam, or vancomycin and cefepime. The primary endpoint was AKI incidence between the two groups, which was defined as the increase in creatinine by 1.5-fold, or 0.3 mg/dL, over the patient's baseline renal function. Secondary endpoints included hospital length of stay and day of AKI onset after antibiotic initiation.

Results: A total of 525 patients were reviewed. Out of 525 patients, 329 patients met inclusion criteria. The vancomycin and piperacillin-tazobactam group (n=263) and vancomycin and cefepime group (n=66) had similar baseline characteristics such as age, gender, baseline serum

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creatinine and use of other nephrotoxic agents. Overall, the occurrence of AKI was 22.05 percent in the vancomycin and piperacillin-tazobactam group compared to 21.21 percent in the vancomycin and cefepime group. This difference was not statistically significant ($P=0.7604$). Patients who developed AKI required a longer length of stay in both groups. For vancomycin and piperacillin-tazobactam, the average length of stay was 9.8 and 6.9 days for the AKI and non-AKI groups, respectively. For vancomycin and cefepime, the average length of stay was 12.36 and 7.81 days in the AKI and non-AKI groups, respectively. When the first day of AKI occurrence during antibiotic therapy was examined, patients in the VPT group experienced a slightly earlier AKI onset compared to the VC group (Day 5 vs 6.2, respectively).

Conclusion: The results of this study suggest there is no difference in occurrence of AKI between patients who received VPT compared with VC. In both groups, development of AKI was associated with a longer length of stay.

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Session-Board # - 4-082

Poster Title: Economic burden of bloodstream infection among those who survive or die during the inpatient hospitalization: analysis of 2015 National Inpatient Sample

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Bloodstream infections (BSI) and sepsis are one of the leading causes of death in the United States (US). They represent the most significant cause of death in the inpatient setting. The purpose of this study was to evaluate the economic burden associated with mortality in patients with BSI and sepsis-related hospitalizations in the US.

Methods: Data from the 2015 US National Inpatient Sample (NIS) was used to achieve the purpose of this study. BSI and sepsis-related hospitalizations were identified using any diagnosis column ICD-9 codes outlined in the literature. Relevant ICD-10 codes were then mapped to the ICD-9 codes using the Centers for Medicare and Medicaid Services (CMS) General Equivalence Mappings file. Hospitalization demographics, characteristics, and outcomes including the mean costs and length of stay (LOS) associated with BSI and sepsis-related hospitalizations were estimated overall and stratified by whether the patient was discharged alive or not. Sensitivity analyses were performed using the primary and primary or secondary diagnosis columns.

Results: Overall, 2,528,695 admissions were observed in 2015. BSI and sepsis-related hospitalization was estimated as 7.1 percent of all hospitalizations. BSI and sepsis-related hospitalizations were costly with a mean cost of \$23,968 overall and a mean LOS of 9.3 days for Q1-Q3 2015, and a mean cost of \$23,449 overall and a mean LOS of 9.0 days for Q4 2015. For Q1-Q3 2015, the mean cost was \$22,503 with a mean LOS of 9.3 days among those who survived through hospital discharge and \$35,827 with a mean LOS of 9.6 days among those who

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died during the hospitalization. For Q4 2015, the mean cost was \$21,962 with a mean LOS of 8.9 days among those who survived and \$36,237 with a mean LOS of 9.4 days among those who died. The cost per day overall for Q1-Q3 2015 was \$2,588 while the cost per day among those surviving was \$2,377 and among those dying was \$4,399, representing an increase in the cost per day of 85%. For Q4 2015, the cost per day overall was \$2,675 while the cost per day among those surviving was \$2,453 and among those dying was \$4,632, representing an increase of 89 percent.

Conclusion: Using nationally-representative inpatient hospitalization data, the results of the study suggest that BSI and sepsis-related hospitalizations that result in in-hospital death incur higher total and per day costs. There is an increased cost and longer lengths of stay associated with patients not discharged alive. There is a considerable need for better treatment options to reduce mortality and thus indirectly reduce the economic burden on hospitals.

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Session-Board # - 4-083

Poster Title: Impact of vancomycin loading doses on methicillin resistant staphylococcus aureus (MRSA) minimum inhibitory concentrations

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: A community hospital reported a trend of increasing minimum inhibitory concentrations (MIC) for vancomycin with methicillin resistant *Staphylococcus aureus* (MRSA). Although the Infectious Diseases Society of America guidelines only recommend vancomycin loading doses for seriously ill patients, a pharmacist-managed pharmacokinetic dosing service began administering loading doses in all adult patients receiving vancomycin due to worsening MIC trends. The objective of evaluating this dosing practice change was to determine if administering loading doses in all adult vancomycin patients impacted MRSA vancomycin MIC values.

Methods: Since December 2013, any patient 18 years and older receiving vancomycin has been administered a loading dose at 25 milligrams per kilogram with a maximum dose of 2 grams unless the patient had already received the first dose. The effect of loading doses on vancomycin MIC values for MRSA was evaluated after approximately three years of data had been collected. Retrospective data for all inpatients was collected each month during the pre-intervention (January 2011 to November 2013) and post-intervention (December 2013 to September 2016) periods. No inpatient data was excluded from review. The primary endpoint evaluated was mean vancomycin MIC values for MRSA before and after the intervention. Only the first positive MRSA culture from any specific patient was included during each calendar year and was determined via an automated broth dilution instrument. The secondary endpoint evaluated was vancomycin usage defined as mean days of therapy (DOT) per 1000 patient days to determine if any change in vancomycin MIC values could be contributed to a reduction in vancomycin usage. An interrupted time series analysis with Newey-West standard errors for

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coefficients was conducted, which was estimated by ordinary least-squares regression and months as the time series interval.

Results: Vancomycin MIC values for MRSA from 2011 to 2016 were reported as 1 or 2 for all patients except for two patients who had MICs of 0.5. There was no difference in the mean vancomycin MIC for MRSA when comparing the pre-intervention and post-intervention periods (1.64 vs. 1.65; p equals 0.94). The mean vancomycin MIC for MRSA increased during the pre-intervention period (coefficient equals 0.007; p less than 0.001) and then decreased post-intervention (coefficient equals -0.007, p equals 0.006). There was no difference in mean vancomycin DOT per 1000 patient days for the pre-intervention and post-intervention periods (62.86 vs. 63.03; p equals 0.92). The mean vancomycin DOT per 1000 patient days decreased during the pre-intervention period (coefficient equals -0.315; p equals 0.005) but was constant during the post-intervention period (coefficient equals equals -0.066, p equals 0.574).

Conclusion: A significant decrease in the vancomycin MIC for MRSA was demonstrated after the implementation of loading doses in all adult patients receiving vancomycin. The change in vancomycin MIC could not be contributed to a decrease in vancomycin DOT per 1000 patient days.

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Session-Board # - 4-084

Poster Title: Evaluation of the development of acute kidney injury in patients receiving piperacillin-tazobactam with concomitant vancomycin or telavancin

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: The combination of piperacillin-tazobactam (PIP-TAZO) and vancomycin is associated with an increased frequency of acute kidney injury (AKI) in hospitalized patients. Telavancin is an antibiotic similar to vancomycin used for gram-positive infections and has been reported to cause AKI. At AtlantiCare Regional Medical Center (ARMC), the use of telavancin with PIP-TAZO is not uncommon, yet there is a paucity of published data regarding the development of nephrotoxicity with this combination. The purpose of this evaluation is to compare the incidence of AKI in patients receiving PIP-TAZO with concomitant vancomycin or telavancin in our community hospital.

Methods: This retrospective evaluation included patients admitted to ARMC between November 2016 and March 2018 who were ordered either vancomycin or telavancin in combination with PIP-TAZO. Patients included in this study received the drug combination for 3 or more days. Patients were excluded if they had a baseline calculated creatinine clearance (CrCl) of less than 20 milliliters per minute (mL/min). Subjects were identified from a generated report using Cerner Discern Explorer. Any cases of AKI were defined by a serum creatinine (SCr) increase of 0.5 milligrams per deciliter (mg/dL) or a 50 percent increase from baseline when observed within 7 days of the studied antibiotic combination. Nephrotoxicity or AKI was also assessed utilizing published criteria for renal risk, injury, failure, loss, and end-stage renal disease known as RIFLE Criteria. Medical records were reviewed and data collection included patient demographics, past medical history, prior history of AKI, level of treatment acuity, CrCl,

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laboratory results, and urine output. Also recorded was the use of concurrent nephrotoxins as determined by study investigators. The doses and duration of study antibiotics were documented, vancomycin trough levels, as well as evaluating for renal dose adjustments when indicated. Statistical analysis was performed to compare baseline characteristics and the development of AKI between the 2 groups. The institutional review board at ARMC granted approval for this evaluation.

Results: Fifty-eight patients with an average age of 56 years (range 27 to 79 years) with 30 patients being female (51.7 percent) met inclusion criteria. Thirty patients were included in the vancomycin and PIP-TAZO arm and 28 in the telavancin and PIP-TAZO arm. The baseline SCr ranged from 0.7 to 1.5 mg/dL, and 9 of 58 patients (15.5 percent) had a documented history of AKI. There were no statistically significant differences observed between study group baseline characteristics. All patients received PIP-TAZO 3.375 grams every 8 hours as a 4 hour extended infusion and the average telavancin dose was 7.5 milligrams per kilogram. The average duration of therapy was similar between the vancomycin (4.8 days) and telavancin (4.3 days) study groups. Ten of 58 patients developed AKI, 5 (16.7 percent) in the vancomycin group and 5 (17.9 percent) in the telavancin group (p-value of 0.999). Only 1 case in each study arm had a SCr increase above 2 mg/dL (maximum of 2.4 mg/dL) and patients all returned to their baseline within 10 days. Seven of the 10 AKI cases involved concomitant nephrotoxins, and in both study groups 3 of 5 patients had telavancin or vancomycin discontinued when AKI developed.

Conclusion: The development of AKI appears to be the similar when comparing vancomycin and PIP-TAZO with telavancin and PIP-TAZO in our population. It is noteworthy that PIP-TAZO was given as an extended infusion and telavancin dosing was lower than the manufacturer recommendations in this evaluation. Additional studies are warranted to further examine the occurrence of AKI with these antibiotic combinations.

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Session-Board # - 4-085

Poster Title: Evaluating the impact of opioids on length of stay in patients with Clostridium difficile infections

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: The 2010 Infectious Diseases Society of America (IDSA) and the 2017 American College of Gastroenterology guidelines both recommend the avoidance of antimotility agents in patients with Clostridium difficile infections (CDIs) to prevent complications, but these recommendations are based on poor and low quality evidence. Given the limited evidence available since 2010, the 2018 IDSA guideline no longer contains formal recommendations regarding antimotility use. Opioids have a class effect of decreasing peristalsis. Therefore, the opioid population can be used to examine the possible link between antimotility use and worse outcomes.

Methods: Using data retrospectively collected from the institution's electronic records, we identified patients with a first time diagnosis of CDI. Data were categorized into two groups: the no opioid group (NOG) and the opioid group (OG). Patients were placed into the NOG if they were administered an average of less than or equal to 10 milligrams (mg) of oral morphine equivalents (OMEs) per day while hospitalized. Patients were placed into the OG if they were administered an average of more than 10 mg of OMEs per day while hospitalized. The primary endpoint was difference in length of stay (LOS). Secondary endpoints included differences in CDI severity based on the 2010 IDSA classification and recurrence within ninety days. Statistical analyses were conducted with SAS version 9.4 software (SAS Institute, Cary, North Carolina). P values of less than 0.05 were considered statistically significant.

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Results: A total of 112 patients were included in this study with 79 patients in the NOG and 45 in the OG. The median opioid use was 0 ± 0.4 OMEs per day in the NOG and 36 ± 40 OMEs per day in the OG ($p < 0.0001$). The NOG consisted of older patients (73 ± 18 vs. 59 ± 20). The average LOS was 5.6 in the NOG and 5.58 in the OG, which was found to be not statistically significant ($p=0.98$). Rates of severe (49.25% vs. 42.22%, $p=0.46$) and complicated (32.87% vs. 28.89% $p=0.66$) infections were similar between the NOG and the OG. Recurrence rates were also similar between the NOG and OG (23.88% vs. 17.78%, $p=0.49$).

Conclusion: Based on this small retrospective analysis, it appears opioid use may not increase LOS or influence CDI severity. Future prospective studies are needed to confirm these findings.

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Session-Board # - 4-086

Poster Title: Impact of a urinary tract infection treatment pathway on antimicrobial prescribing within a community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Treatment algorithms are often implemented within healthcare institutions as measures to reduce costs while improving patient outcomes. As antibiotic resistance rates continue to rise and therapeutic options remain limited, urinary tract infections (UTIs) represent a growing public health concern. Based on the institutional formulary, clinical experience, local resistance patterns, and consensus guidelines, the Pharmacy and Therapeutics Committee at Baptist Health South Florida approved an evidence-based treatment pathway for UTIs to be used as guidance for empiric antibiotic therapy. The purpose of this study was to assess whether this pathway is an effective stewardship effort to promote appropriate antibiotic use.

Methods: This study was approved by the Baptist Health South Florida Institutional Review Board. The study consisted of two phases and included patients at least 18 years of age. Phase I was a retrospective chart review of admitted patients diagnosed with a UTI between November 2016 and October 2017. Phase II was a prospective review of admitted patients with positive urine cultures after implementation of the UTI treatment pathway between January 2018 and March 2018. Patients were excluded from the study if they had a diagnosis of febrile neutropenia, acute bacterial prostatitis, or another coexisting infection. Adherence to the UTI treatment algorithm was used to determine appropriateness of antibiotic therapy.

Results: A total of 50 patients were reviewed during phase I of the study while 50 patients were reviewed during phase II. The majority of patients were female (74 percent in phase I vs. 64 percent in phase II) and had a diagnosis of severe and/or complicated UTI (44 percent in phase I

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vs. 46 in phase phase II). Appropriate empiric antimicrobial use increased from 30 percent to 58 percent after implementation of the UTI treatment pathway. Average length of stay decreased from 7.8 days to 6.7 days, and average duration of antibiotic therapy decreased from 8 days to 6.7 days.

Conclusion: Implementation of a UTI treatment pathway improved appropriate empiric use of antimicrobial agents. Additionally, this pathway reduced average duration of antibiotic therapy as well as length of stay. Pharmacists are well equipped to further improve patient outcomes and reduce healthcare costs by promoting pathway adherence and antimicrobial de-escalation.

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Session-Board # - 4-087

Poster Title: The prevalence of all types of infections among schizophrenic patients residing in a Lebanese tertiary hospital

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: People with schizophrenia have not fully taken advantage from the improvements in health outcomes available to the general population and therefore their risk of infections have been increasing, so special guidelines for the prevention of infections might be needed in case of any association between the two diseases. The main objective of this study is to assess the prevalence of all types of infections among schizophrenic patients residing in a tertiary institution in Lebanon. The secondary objective is to assess factors that increase risk of infections among schizophrenic patients including age, comorbidities, length of stay, and the use of antipsychotics.

Methods: We examined risk of infection in relation to schizophrenia based on retrospective access to medical records of a tertiary health care hospital from December 2016 till December 2017. We calculated the odds ratios and 95% confidence intervals using Pearson's chi-square test to investigate bivariate associations and student t-test to analyze continuous data. Binary logistic regressions run to examine the strength and precision of the associations controlling for potential confounders such as age, use of antipsychotics, smoker, alcohol intake and length of stay. We classified infections as systemic (upper respiratory tract, pneumonia, urinary tract infections and gastrointestinal infections) and local infections (skin and soft tissue infections, conjunctivitis and onychomycosis).

Results: Among 344 schizophrenic patients, 51.1 % of the patients developed all type of infections (systemic & local). 50.6 % of patients who developed infections aged more than 55 years. The most prevalent infections were respiratory infections (68.75 %), urinary tract

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infections (17.6%), and soft tissue infections (15.3 %). Patients who had mean duration of stay at the institution of less than 10 years had more risk to develop GI infection (P value <0.008) and soft tissue infections (P value <0.02) compared to patients with mean duration of stay of more than 10 years. No significant difference in patients taking antipsychotics and infections nevertheless, patient taking Zuclopenthixol has 3.4 times the odds of having systemic infections compared to local infections, 95 % CI (1.389-9.277). As for the type of systemic infection, patient who is taking Zuclopenthixol has 1.786 the odds of having respiratory infections (95 % CI 1.103-2.890). In addition, patient who is taking Olanzapine has 1.954 the odds of having respiratory infections (95 % CI 1.002-3.811). As for local infections, data showed that patient taking Haloperidol or Chlorpromazine has 2 times the odds of having local infections 95 % CI (1.047-4.411) (1.089-3.826) respectively.

Conclusion: This study assessed the prevalence of infections among schizophrenic patients in one tertiary institution. More studies are warranted to reflect the prevalence of infections among schizophrenic patients in Lebanon. Nevertheless, this study showed that these patients are at higher risk to develop systemic infections compared to local infections especially among patients who are residing in the institution for less than 10 years. In addition, this study showed that the risk of systemic infections in particular respiratory infections was higher among patients taking Zuclopenthixol or Olanzapine. Our findings suggest that special considerations should be undertaken to prevent infections among these patients.

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Session-Board # - 4-088

Poster Title: Evaluation of antibiotic prescribing for acute otitis media in children in a rural outpatient setting

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: The rate of inappropriate antibiotic use is reported to be as high as 50 percent in the outpatient setting. Acute otitis media is one of the most common indications for antibiotic use in children. Appropriate drug selection with an adequate weight-based dose and recommended duration reduces antibiotic misuse which limits the spread of resistance and the risk of treatment failure. The purpose of this study was to evaluate prescribing compliance with published guidelines for acute otitis media at a rural outpatient clinic.

Methods: This was a retrospective evaluation in an outpatient clinic of patients who were twelve years of age or less who were prescribed an antibiotic for acute otitis media between January 1st, 2017 and December 31st, 2017. Data collected included patient age, weight, antimicrobial regimen (i.e. agent, dosing, duration), and documentation of “watchful waiting.” Watchful waiting was defined as a diagnosis of acute otitis media without issuing an antibiotic prescription. Appropriateness of drug selection, dosing, and duration was assessed as outlined in the 2013 American Academy of Pediatrics clinical practice guideline on the diagnosis and management of acute otitis media.

Results: A total of 244 patients were identified within the pre-specified time period with 208 patients prescribed an antibiotic and 36 patients being excluded. The most common reasons for exclusion were follow-up appointments to evaluate resolution of acute otitis media and the presence of tympanostomy tubes. The average age was 3.31 years (± 3.11). An appropriate antibiotic was prescribed in 55.8 percent (116/208) of patients. Appropriate weight-based dosing was utilized in 43.9 percent (68/155) of patients and the duration of therapy prescribed

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was appropriate in 96.1 percent (171/178) of regimens. The most common cause of inappropriate prescribing included too low of an amoxicillin dose (i.e. below the recommended 80-90 mg/kg/day) and the selection of azithromycin or cefdinir without a documented allergy or failure to first-line agents. There were two cases of watchful waiting identified.

Conclusion: Antibiotic selection and dosing for acute otitis media in an outpatient setting were commonly inconsistent with current national guidelines while antibiotic durations were most often appropriate. Opportunities exist for optimizing antimicrobial therapy for the treatment of acute otitis media within the outpatient setting.

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Session-Board # - 4-089

Poster Title: Evaluation of a pharmacist-led urgent care antimicrobial stewardship program

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Antimicrobial resistance is one of the most serious threats to public health. Antimicrobial stewardship initiatives have begun to expand from acute care to ambulatory care settings. While many programs have demonstrated pharmacist-led stewardship successes in inpatient and emergency department (ED) settings, there is a paucity of literature exploring these initiatives in urgent care (UC) sites. This study aimed to determine the impact of implementing a pharmacist-led antimicrobial stewardship program (ASP) in the UC setting.

Methods: A retrospective quasi-experimental study was conducted evaluating patients from two health system-affiliated UC sites with positive urine or wound culture results following discharge. In April 2015, the health system's infectious diseases and ED pharmacists, with support from UC providers, implemented empiric therapy guidelines and a collaborative practice agreement allowing for pharmacist-led culture follow-up via a stewardship-focused protocol. The primary outcome of this study was to compare guideline-concordant antibiotic prescribing (defined as the combination of appropriate agent, dose, and duration of therapy) between the Pre-ASP and Post-ASP groups. Secondary outcomes included comparing the number of patients who required follow-up, time to follow-up, UC or ED revisits within 72 hours, and hospital admission within 30 days between groups.

Results: 300 patients were included in the study (Pre-ASP n=150, Post-ASP n=150). Total guideline-concordant prescribing for all diagnoses was significantly improved in the Post-ASP group compared to the Pre-ASP group (41.3% vs. 53.3%, p=0.037). Guideline-concordant

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antibiotic selection improved in the Post-ASP group (51% vs. 68%, $p=0.01$) while dose (70 % vs. 74%, $p=0.287$) and duration (61% vs. 65%, $p=0.283$) were similar between groups. Follow-up was required for 27 (18%) patients in the Pre-ASP group vs. 16 (10.7%) in the Post-ASP group ($p=0.07$), however median time to follow-up call was longer in the Post-ASP group (71 vs. 38 hours, $p<0.001$). There were no differences between groups in UC ($p=1.0$) and ED revisits ($p=1.0$) within 72 hours or hospital admissions within 30 days ($p=0.723$).

Conclusion: A pharmacist-led urgent care ASP was associated with significantly improved guideline-concordant antimicrobial prescribing.

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Session-Board # - 4-090

Poster Title: Sepsis rapid response team performance improvement initiative

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Timely identification and treatment of patients in sepsis or septic shock are critical for improving patient care and patient outcomes. The objective of this study was to form a multidisciplinary sepsis rapid response team with continuous performance improvement to identify and treat patients in sepsis in a timely manner.

Methods: This study received institutional review board approval. Our hospital formed a multidisciplinary sepsis rapid response team to improve early identification and treatment of patients with sepsis outside the intensive care units. Pharmacists joined the team in April 2017. The team consists of physicians, nurses, advanced practice clinicians, pharmacists, and phlebotomists. Patients were identified through the electronic medical record for systemic inflammatory response syndrome criteria and signs of end organ dysfunction. This alerted the sepsis rapid response team to further evaluate the patient and initiate therapy, if the patient meets criteria. Pharmacists' role includes evaluation of the patient, recommendation of antibiotic regimen, doses and frequencies, verification of antibiotic orders, timely delivery of antibiotics to the patient's nurse, and facilitation of timely antibiotic administration. Pharmacists also recommend sequence of antibiotic administration, verify drug compatibility, and provide necessary drug information. Objective data collected include time of order entry, order verification, and antibiotics administration. Mortality rate was analyzed monthly. Monthly team meetings and data analysis are conducted for continuous performance improvement to identify issues and implement corrective actions in order to strengthen timely antibiotic administration and patient outcomes.

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Results: The number of patients evaluated by pharmacists has increased over a one year period from 6 to 40 per month, average 18.7 ± 13 SD. Average number of patients that required pharmacist intervention was 8.1 ± 3.3 SD per month. The mean and median time for antibiotic order and verification was 6.0 ± 4.4 SD and 3 (range 1-6) minutes, respectively. The mean and median times for first dose antibiotic administration were 51.8 ± 23.8 SD and 34.1 (range 15-49.5) minutes, respectively. Overall there was improvement in time to antibiotic administration over a one year period. Identified issues leading to a delay in antibiotic administration include problems with intravenous line access, time to draw blood cultures before antibiotic administration, drug shortages, drug incompatibility, delayed alert notification, and incorrect charting of administration times. The average mortality rate decreased from 18 percent ± 2.61 SD to 15.9 percent ± 2.63 SD after pharmacists' participation in the sepsis rapid response team.

Conclusion: A multidisciplinary sepsis rapid response team that includes pharmacists is useful for identifying patients with sepsis and assuring appropriate and timely administration of antibiotics.

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Session-Board # - 4-091

Poster Title: Impact of antimicrobial stewardship program implementation on antibiotic expenditures, bacterial resistance, and *Clostridium difficile* incidence at a suburban community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Increasing antimicrobial resistance is a looming public health threat that has claimed tens of thousands of lives that costs the United States healthcare industry billions of dollars per year. Appropriate antibiotic use through implementation of interdisciplinary stewardship programs is recommended by the Centers for Disease Control's Core Elements and numerous other published guidelines. This study was designed to assess the impact of the implementation of a diverse set of antimicrobial stewardship interventions on antibiotic expenditures, bacterial resistance, and *Clostridium difficile* incidence at a 200-bed community hospital in suburban Long Island.

Methods: Implementation of an antimicrobial stewardship program consisted of a multimodal approach which included around-the-clock pharmacist-assisted dose optimization, clinical pharmacist participation in interdisciplinary rounds in the hospital's critical care unit, daily pharmacist-driven intravenous-to-oral conversions using automatic substitution protocols, prospective antibiotic review and restriction of a limited number of antibiotics to infectious disease-specialized physicians. Restricted antimicrobials included the carbapenems, daptomycin, linezolid, ceftaroline, and tigecycline, among others which constitute 30 percent of the institution's antimicrobial formulary. The hospital also implemented an electronic medical record, performs annual antibiogram analyses and created an antimicrobial stewardship committee, consisting of representatives from medicine, pharmacy, infection prevention and nursing, which meets twice weekly. The committee evaluates all patients on restricted

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antibiotics as well as those patients who have received greater than five days of antimicrobial therapy and makes interventions to prescribers. All interventions are documented in the hospital's electronic medical record. Implementation of the antimicrobial stewardship took place over a period between June 2014 and February 2016. In addition to antimicrobial stewardship, the hospital also instituted policies to target *Clostridium difficile* by modifying cleaning policies and implementing changes to contact isolation procedures. Antimicrobial stewardship performance metrics assessed include changes in antibiotic expenses, *Clostridium difficile* rates, and susceptibility trends of common bacterial pathogens.

Results: During the period between January 2015 and April 2018, total antibiotic expenditures per 1000 patient days had decreased by 39.1 percent, which occurred after adding a clinical pharmacist in the critical care unit, establishing stricter pharmacist-driven antibiotic review policies, and the establishment of the antimicrobial stewardship committee. This resulted in a total of \$260,000 in savings between January 2015 and December 2017. Total Carbapenem expenses and usage decreased by 71.5 percent over the 3-year period. Tigecycline expenses decreased by 63 percent, Daptomycin expenses decreased by 43.3 percent and linezolid expenses decreased by 74.9 percent. Between 2012 and 2017, *Clostridium difficile* rates had decreased by 75 percent from 18.12 to 4.36 cases per 10,000 patients. Between 2016 and 2017, *Clostridium difficile* rates decreased by 42% alone. Between 2012 and 2017, sensitivities of *Staphylococcus aureus* and *Enterococcus faecalis* have remained stable and highly susceptible to first-line therapies. Among gram-negative pathogens, there has been fluctuations in resistance for *Acinetobacter baumannii* with most antibiotics and an increase of resistance to cephalosporins and aztreonam with *Klebsiella* and *Escherichia coli*. This trend is driven by an increase in extended-spectrum beta-lactamase strains. Resistance to piperacillin-tazobactam, carbapenems, and anti-gram-positive agents have remained relatively unchanged during the study period.

Conclusion: Antimicrobial stewardship is an essential and effective program in reducing and preventing unnecessary or inappropriate antimicrobial utilization, reducing *Clostridium difficile* infections and preventing antimicrobial resistance to antibiotics. An interdisciplinary approach that included a partnership between clinical and nonclinical departments had resulted in a successful implementation of this program that contributed to a decrease in antibiotic spending, decreased incidence of *Clostridium difficile* and maintained stable resistance patterns among common pathogens.

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Session-Board # - 4-092

Poster Title: Infectious endocarditis by staphylococcus aureus: adequacy of treatment and morbimortality

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Infective endocarditis (IE) by Staphylococcus aureus (SA) is a deadly disease. Despite improvements in its management, IE remains associated with high mortality and severe complications. The aim of the study is to analyze the adequacy of antibiotic treatment in infectious endocarditis (IE) by Staphylococcus aureus (SA) and to assess morbidity and mortality associated.

Methods: Retrospective observational study realized over a period of 2 years and 7 months, between August-2014 and March-2017. All patients with suspected IE were included. Definitive IE was considered once diagnosed after blood culture-positive for SA and transesophageal or transthoracic echocardiography.

Variables gathered were: demographic data, empirical/target antimicrobial treatment (E/T), methicillin-resistant or methicillin-susceptible SA (MRSA/MSSA), native/prosthetic valve infection (NV/PV). The degree of adequacy of the antimicrobial regimen in IE by SA was analyzed according to the consensus document published by the SEIMC (Sociedad de Enfermedades Infecciosas y Microbiología Clínica) in 2015, which recommends the following therapy:

1. Empirical treatment for suspicion of IE by MSSA or MRSA: E-MSSA: Cloxacillin±Daptomycin. E-MRSA: Cloxacillin+Daptomycin
2. Target treatment with diagnosis of IE either by MSSA or MRSA either in PV or NV: T-MSSA-NV: Cloxacillin. In case of allergic to beta-lactams (T-MSSA-NV-A): Daptomycin+Fosfomicin. T-

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MSSA-PV: Cloxacillin+Rifampicin+Gentamicin. T-MRSA-NV: Cloxacillin+Daptomycin. T-MRSA-PV: Daptomycin+Rifampicin+Gentamicin.

To determine morbidity and mortality in these patients, the variables gathered were: hospital stay in patients who completed antibiotic treatment (between 4 and 6 weeks after negative blood cultures), cardiac surgery performed as consequence of IE, embolic complications and mortality.

Results: Fifteen patients were treated for suspicion of IE by SA with an average age of 76 years, 73% of whom were men.

The adequacy of the antimicrobial treatment was the following: E-MSSA 100% (2/2 patients), E-MRSA 25% (1/4), T-MRSA-NV 0% (0/4, because in all Daptomycin was associated with Cloxacillin), T-MSSA-NV-A 100% (1/1), T-MSSA-PV 0% (0/2, because Daptomycin was in all), 100% (1/1) and T-MRSA-PV 0% (0/1, because neither Rifampicin nor Gentamicin was associated). The degree of adequacy to the consensus document was 33%.

Average hospital stay was 47 days. Of the 9 patients with definite IE by SA: 33% (3/9) cardiac surgery was required; 56% (5/9) had embolic complications and 44% (4/9) died during their hospital admission.

Conclusion: Due to the low degree of adequacy registered and the fact that optimal treatment still being discussed, it would be convenient to establish a protocol in our hospital for the treatment of IE by SA.

IE is associated with a high morbidity and mortality, so it is necessary to detect and treat the disease at an early stage with the most appropriate antimicrobial regimen to reduce its mortality and its serious complications.

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Session-Board # - 4-093

Poster Title: Sustained virologic response rates after hepatitis C virus treatment in patients born between 1945 and 1965

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Direct-acting antiviral (DAA) regimens offer high sustained virologic response (SVR) rates for hepatitis C virus (HCV) treatment. In addition to risk-based HCV screening, national guidelines recommend a one-time HCV screening for all patients born between 1945 and 1965 (babyboomers), regardless of transmission risk. It is estimated that 75% of the patients in the United States were born within this birth cohort. However, real-world data on this patient population is unreported. The objective of this study is to describe and compare HCV SVR rates among babyboomers treated with DAAs at an urban academic medical center.

Methods: Investigators performed a retrospective cohort study of the electronic records of patients who started HCV treatment from January 1, 2014 to December 1, 2017. Babyboomer patients who started dual-DAA regimens were included. Data collection included baseline characteristics, including age, gender, race/ethnicity, body mass index (BMI), comorbidities, and concomitant medications; and HCV-related data including stage of disease, HCV treatment history, regimen, and lab values. Data were described with counts/percentages for categorical data and means/standard deviations for continuous data. The primary endpoint was the SVR rate for babyboomer patients. The secondary endpoints were SVR rates by patient characteristics; rates were compared using chi-square tests and SAS software. This research was approved by the institutional review board.

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Results: Of the 822 patients treated for HCV, 602 (73 percent) were babyboomers. The patients were 63 percent male, 64 percent black, 41 percent Medicaid-insured, had a mean age of 60.5 years, and BMI of 29.3 kg/m². The population was, 93 percent genotype 1, 50 percent cirrhotic, 24 percent treatment-experienced, 11 percent post-transplant. Comorbidities included 6 percent hepatocellular carcinoma (HCC); 4 percent HIV, 30 percent diabetes; and 25 percent psychiatric illness. Sixty-six percent were treated with ledipasvir/sofosbuvir±ribavirin. The intent-to-treat SVR rate was 86 percent (518/602). Excluding the 33 patients lost-to-follow-up and 15 patients who discontinued treatment, the SVR rate was 94 percent (518/554) per protocol. The SVR rates differed by presence of cirrhosis (98 percent in non-cirrhotic patients versus 89 percent in cirrhotic patients, p less than 0.0001), gender (97 percent in females versus 92 percent in males, p equal to 0.0128), treatment history (96 percent in treatment-naïve patients versus 87 percent in treatment-experienced patients, p equal to 0.0002), and history of HCC (94 percent in non-HCC patients versus 82 percent in HCC patients, p equal to 0.005). SVR rates did not differ by race/ethnicity, obesity, diabetes, psychiatric illness, or insurance (p greater than 0.05).

Conclusion: Most of the HCV-treated patients at the urban medical center were babyboomers; this supports the national estimates of babyboomer prevalence among HCV-infected patients. Among these patients, treatment-naïve patients had higher SVR rates than treatment-experienced patients, non-cirrhotic patients had significantly higher SVR rates than cirrhotic patients in this diverse patient population. HCC typically develops in cirrhosis; low SVR rates were seen in HCC patients in this population. These results support HCV treatment prior to progression to cirrhosis to allow for increased SVR rates. Gender differences can be further explored as no published literature addresses this in the DAA era.

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Session-Board # - 4-094

Poster Title: Evaluating the increase in carbapenem use in a large, tertiary care, metropolitan hospital with antibiotic utilization monitoring by the antibiotic stewardship program (ASP)

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Carbapenems are broad spectrum antibiotics reserved for treatment of serious infections in patients with risk factors for, history of, or evidence of multidrug resistant gram negative bacteria. At our institution, carbapenem use requires approval by an infectious disease (ID) physician and subsequent review by the ASP. In December 2015, the preferred carbapenem was switched from imipenem to meropenem. The ASP monitors antimicrobial utilization quarterly using the defined daily dose metric. Review of utilization data confirmed the formulary switch but also revealed an increase in carbapenem usage in fourth quarter 2016. A medication use evaluation was performed to assess this increase.

Methods: A list of all patients 18 years of age and older with an order for meropenem or imipenem between October 1, 2015 to December 30, 2015 and October 1, 2016 to December 30, 2016 was identified from the hospital's medical record. The data collected included: age, gender, meropenem or imipenem dose and frequency, renal function, duration of therapy, associated culture and sensitivity data, indication of use and etiology of infection. Chi-squared analysis was used to determine the statistical difference in the number of patients on carbapenems between the two quarters. The study was deemed a quality improvement study thus was exempt from institutional board review.

Results: Twenty-four patients received carbapenems in 4th quarter 2015 when utilization was steady versus forty-four patients when carbapenem usage peaked ($p=0.011$) in 4th quarter

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2016. Of the patients that received carbapenems, 46% (11/24) of patients received meropenem during 2015 contrasted with 89% (39/44) of patients in 2016. The average duration of therapy in 2015 was 11.5 days (range 1-42 days) vs. 7.3 days (range 1-32 days) in 2016. ID approval and / or consult was obtained in all patients (24/24) in 2015 compared to 93% (41/44) of patients in 2016. Among all patients requiring renal dose adjustments, 97% (36/37) of patients were dose adjusted appropriately. An organism was identified in 67% (16/24) of patients in 2015 versus 64% (28/44) of patients in 2016. All 16 patients (100%) with an identified pathogen had an organism that was resistant to piperacillin-tazobactam or cefepime in 2015. In 2016, 54% (15/28) had documented resistant pathogens, 18% (5/28) had de-escalation of therapy once sensitivities became available, 14% (4/28) did not respond to narrower spectrum agents, 11% (3/28) expired before culture resulted, and 3% (1/28) developed an adverse reaction to optimal therapy. The sources of infections varied between the two study periods.

Conclusion: Evaluation of the increase in carbapenem use in 4th quarter 2016 compared to 4th quarter 2015 demonstrated a larger number of patients on carbapenem therapy as opposed to a longer duration of antibiotic courses. In-depth review of utilization confirmed that carbapenems were used for appropriate indications. The increased use was due to treatment of patients with documented resistant pathogens and when de-escalation to a narrower spectrum agent was feasible, it took place in a timely manner. Renal dosing was appropriate and review was performed by the ID consult service as required by our hospital protocols.

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Session-Board # - 4-095

Poster Title: Efficacy of posaconazole delayed-release tablet for prevention of invasive fungal disease during chemotherapy-induced neutropenia

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Posaconazole is one of the recommended agents to prevent invasive fungal disease (IFD) in acute myelogenous leukemia (AML) and myelodysplastic syndrome (MDS) patients undergoing induction or re-induction chemotherapy. However, there has been only one clinical trial demonstrating its superiority over other azole agents, and it was performed using the oral suspension form of posaconazole. The delayed-release (DR) tablet formulation of posaconazole has since been developed with improved bioavailability and more consistent pharmacokinetics. The purpose of this study was to compare the efficacy of posaconazole DR to fluconazole in AML and MDS patients undergoing induction chemotherapy at an academic medical center.

Methods: The institutional review board exempted this study as a quality improvement project. Adult patients hospitalized between November 2014 and December 2017 for induction or re-induction chemotherapy for AML or MDS were reviewed. In August 2016, the institution transitioned from oral fluconazole to posaconazole DR as the preferred agent for prevention of IFD in AML and MDS patients. A cohort of fluconazole recipients prior to this transition was compared to posaconazole recipients. Patients were excluded if they received other systemic antifungal agents or were diagnosed with IFD within 30 days prior to initiation of chemotherapy. The primary outcome investigated was the rate of proven or probable IFD within 100 days of initiation of chemotherapy. Criteria defined by the European Organization for Research and Treatment of Cancer were used to categorize IFD as proven or probable disease. The primary outcome was analyzed in both the Intent-To-Treat (ITT) and Per-Protocol (PP) groups, where the ITT included all patients who initially received fluconazole (n equals 15) or posaconazole (n equals 23), while the PP group included patients who remained on fluconazole (n equals 9) or posaconazole (n equals 13) during the study period. Secondary

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endpoints included types of IFD, mortality and readmission with IFD, and frequency and reasons for switch in antifungal agents. Data are expressed as percentage with p value of less than 0.05 defined to detect significance.

Results: In the ITT analysis of the primary outcome, proven or probable IFD occurred in 4 patients (26.7 percent) in the fluconazole group compared to 0 patients in the posaconazole group (p equals 0.018). In the PP analysis, proven or probable IFD occurred in 4 patients (44.4 percent) in the fluconazole cohort compared to 0 patients in the posaconazole group (p equals 0.017). The most common type of IFD was aspergillus pneumonia except for one patient in the fluconazole group with candidemia. The rate of antifungal switch occurred frequently in both fluconazole and posaconazole groups, at 60 percent at 43.5 percent, respectively. Fluconazole was switched most commonly for suspected IFD, while posaconazole was switched most often for adverse events followed by suspected IFD. Adverse events observed in the posaconazole group were hyperbilirubinemia, persistent nausea, and QT prolongation. Mortality possibly associated with IFD in the fluconazole and posaconazole DR groups occurred in 22.2 percent and 15.4 percent, respectively, in the subgroup of patients who remained on the antifungal agent of interest. Of the patients who were discharged on fluconazole or posaconazole DR, only one patient in the fluconazole group was readmitted for possible IFD, with inpatient length of stay of 17 days.

Conclusion: While the sample size of this study was small, there was a lower incidence of proven or probable IFD in the posaconazole DR group compared to the fluconazole group. Although fluconazole appears better tolerated and a large proportion of patients switched antifungal agents during hospitalization in both groups, the results of this study support the use of posaconazole DR as an effective prophylactic antifungal agent in AML and MDS patients during induction or re-induction chemotherapy. Larger studies will yield more patients who remain on the antifungal agent of interest and aid in further determining the clinical significance of this study.

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Session-Board # - 4-096

Poster Title: TeleStewardship services in combination with rapid blood pathogen detection increased antimicrobial stewardship interventions and improved compliance with Joint Commission Standards for Antimicrobial Stewardship

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Antimicrobial stewardship programs (ASPs) have been documented in literature to be associated with reduced hospital-acquired *Clostridium difficile* infection rates, reduced hospital-acquired infections, and decreased hospital costs. Although The Joint Commission requires that all hospitals have ASPs, almost 60 percent of US hospitals have ASPs that don't meet all seven of the CDC's core elements. The purpose of this project was to evaluate the impact of TeleStewardship services in combination with rapid blood pathogen detection as an alternative to the traditional ASP model that includes on-site Infectious Disease physicians.

Methods: Hardin Memorial Hospital is a 300-bed hospital in Elizabethtown, KY. Prior to the project, the hospital had implemented a pharmacist-led ASP, however did not employ Infectious Disease physicians and had not yet met all seven of the CDC's core elements of hospital stewardship programs. During the project, the hospital implemented TeleStewardship services, enabling off-site Infectious Disease physicians that are experienced with ASPs to review patient cases and make stewardship recommendations remotely. The hospital also implemented rapid blood pathogen detection, which was immediately reported to clinical pharmacists and evaluated with the primary care team for clinically appropriate adjustments and/or de-escalation of antibiotic therapy.

Results: After the implementation of TeleStewardship services in combination with rapid blood pathogen detection, average monthly pharmacist interventions related to antimicrobial stewardship increased from 100 to 329. In addition, the program reduced average days of

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antibiotic therapy per 1000 patient days by 26 percent. For patients with bacteremia, the average length of stay was reduced from 5.24 to 4.93 days and 30 day readmission rates were reduced by 50 percent. TeleStewardship services also enabled compliance with all seven of the CDC's core elements of hospital stewardship programs.

Conclusion: The addition of TeleStewardship services and rapid blood detection to an existing ASP significantly increased pharmacist's interventions, decreased overall antibiotic use and improved readmission rates and length of stay. TeleStewardship services in combination with rapid blood detect may provide an alternative to traditional ASPs in areas without on-site infectious disease physicians. TeleStewardship services can assist with fulfillment of the Joint Commission requirements for a stewardship program.

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Session-Board # - 4-097

Poster Title: Impact of a levofloxacin restriction program on utilization in a community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Use of fluoroquinolones has been associated with increased bacterial resistance, *C. difficile* infection (CDI), and development of serious adverse reactions (e.g., tendinopathy, central nervous system effects, peripheral neuropathy). During 2015 at Methodist Medical Center of Oak Ridge, levofloxacin utilization was identified as above the Cardinal Health data analytics benchmark. Additionally, levofloxacin susceptibility per the hospital antibiogram was less than 80% against many gram-negative organisms, including *E. coli* and *P. aeruginosa*, making it unsuitable for empiric therapy. Investigators sought to assess the impact of a levofloxacin restriction program on utilization, length of stay, and hospital-acquired *C. difficile* infection (HA-CDI) rates.

Methods: This was a single center, retrospective study comparing levofloxacin utilization and length of stay before (Mar 2015-Feb 2016) and after (Mar 2016-Feb 2018) implementation of a levofloxacin restriction program. Prior to March 2016, levofloxacin was non-restricted. In March of 2016, a levofloxacin restriction was implemented which consisted of criteria allowing use to when no other suitable alternatives were available or there was presence of an allergy to preferred agents. Implementation of the restriction program consisted of prescriber education, pharmacist intervention, removal of levofloxacin from various computerized prescriber order entry order sets, and removal of levofloxacin from first-line status in the institution's empiric antibiotic therapy guidelines. Additional infection prevention (IP) methods for CDI were implemented simultaneously with the restriction and included new room cleaning protocols, new collection and testing protocols, care provider education, and root cause analyses on all new HA-CDI cases. Levofloxacin utilization as defined by days of therapy per 1000 patient days

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(DOT/1000 PD) and length of stay in days (LOS) for the top 10 Diagnosis-Related Groups (DRGs) were assessed pre- and post-implementation. HA-CDI rates as defined by number of cases per 1000 PD (cases/1000 PD) were identified by trained IP practitioners using the National Healthcare Safety Network (NHSN) definition.

Results: The hospital experienced a significant reduction in mean ($\pm$ SD) levofloxacin DOT/1000 PD [(131.4 $\pm$ 16.5) vs. (22.0 $\pm$ 7.3); $p < 0.001$] and HA-CDI cases/1000 PD [1.0 $\pm$ 0.6) vs. (0.4 $\pm$ 0.3); $p = 0.003$] post-implementation. No difference was observed in the mean ($\pm$ SD) LOS between groups in the top 10 DRGs [(6.7 $\pm$ 3.3) vs. (6.7 $\pm$ 3.1); $p = \text{NS}$].

Conclusion: Implementation of a levofloxacin restriction program was an effective strategy for reducing levofloxacin utilization without significantly impacting length of stay. A levofloxacin restriction program may be an effective method for reducing HA-CDI when implemented with infection prevention methods.

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Session-Board # - 4-098

Poster Title: Impact of a pharmacist-driven methicillin-resistant staphylococcus aureus (MRSA) nasal polymerase chain reaction ordering protocol on the duration of antibiotic therapy for pneumonia

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Methicillin-resistant *Staphylococcus aureus* (MRSA) continues to be a common cause of pneumonia. Guidelines recommend initiating empiric therapy with anti-MRSA antibiotics for all inpatients who meet risk criteria, followed by de-escalation of antibiotics based on culture results. However, respiratory cultures are difficult to collect and may not produce a predominant organism. Studies show MRSA nasal polymerase chain reaction (PCR) assay has a high negative predictive value in determining negative MRSA respiratory culture results. The purpose of this study is to evaluate the impact of a pharmacist-driven MRSA nasal PCR protocol on the duration of anti-MRSA therapy in hospitalized patients with pneumonia.

Methods: The institutional review board approved this multi-center, retrospective cohort study. The protocol allowed pharmacists to order MRSA nasal PCR, and pre-selected the assay on order sets for pneumonia. Inpatients greater than 18 years of age receiving empiric anti-MRSA therapy for pneumonia between October 2015 to March 2016 (pre-protocol group) or October 2017 to March 2018 (post-protocol group) were included if they had a negative PCR result (or possibly no PCR if in pre-protocol group). Inpatients with a severe beta-lactam allergy, alternate indication for MRSA coverage, complicated pulmonary infection, or death within 48 hours of admission were excluded. The primary outcome was reduction in anti-MRSA therapy duration in days. Secondary outcomes included total antibiotic therapy duration, hospital and intensive care unit (ICU) length of stay (LOS), rates of vancomycin associated renal dysfunction (VARD) and *C. difficile* infections, cost of anti-MRSA therapy, number of doses and drug levels

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per patient, and protocol compliance. For the primary outcome, 64 participants in each group would yield 80 percent power and two-sided alpha of 0.05 to detect a difference of 2 days between groups. Parametric and non-parametric continuous data were analyzed using Student's t test and Mann–Whitney U test, respectively. Differences in proportions were analyzed using chi-square test or Fisher's exact test, as appropriate. Data are expressed as medians with interquartile ranges (IQR) or as numbers and percentages, as appropriate.

Results: A total of 128 patients were included in this study, N equals 63 in the pre-protocol group and N equals 65 in the post-protocol group. Implementing a MRSA nasal PCR ordering protocol led to a median reduction of 1.6 days in empiric MRSA therapy, from 2.9 days (IQR 1.3 to 4.5) to 1.3 days (IQR 0.8 to 1.9) in the pre- and post-protocol groups respectively (P less than 0.001). There was a median reduction of 5.4 days in total antibiotic therapy, from 6.2 days (IQR 3.9 to 9.5) to 4.8 days (IQR 3.1 to 7.5) in the pre- and post-protocol groups respectively (P equals 0.027). There was no difference in hospital or ICU LOS, incidence of VARD or C. difficile infections, or reduction in cost despite a significant reduction in the median number of doses and levels ordered per patient. Time from presentation to PCR ordering and rate of discontinuation of anti-MRSA therapy based on a negative PCR result were improved in the post-protocol group, however time from PCR result to anti-MRSA therapy discontinuation did not differ between groups.

Conclusion: Implementing a pharmacy-driven MRSA nasal PCR ordering protocol led to a significant reduction in anti-MRSA antibiotic duration without compromising clinical outcomes or patient safety.

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Session-Board # - 4-099

Poster Title: Impact of an antimicrobial stewardship initiative to decrease the use of fluoroquinolones in the treatment of urinary tract infections in hospitalized patients

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Current urinary tract infection (UTI) guidelines discuss that fluoroquinolones, although an effective treatment for UTIs, should be reserved due to the propensity for collateral damage. In addition, empirical treatment with a fluoroquinolone may not be favorable due to local resistance rates to *Escherichia coli*. In 2016, the Food and Drug Administration issued a safety alert stating these side effects can be disabling and potentially permanent, therefore use in UTIs should be limited. The purpose of this study is to evaluate the impact of a pharmacist-led antimicrobial stewardship initiative to decrease the overall use of fluoroquinolones in the treatment of UTIs.

Methods: The institutional review board approved this retrospective cohort study performed at a 687 bed not-for-profit community teaching hospital. A total of 116 adult patients with a suspected or confirmed UTI and prescribed an antibiotic for more than 24 hours were enrolled. The control group includes patients prescribed antibiotics for the treatment of UTI before the fluoroquinolone antimicrobial stewardship initiative (August 2016 to December 2016) and the intervention group includes patients after the initiative (August 2017 to December 2017). The initiative includes a fluoroquinolone restriction and prescribing guide, physician education, antimicrobial treatment cystitis algorithm, Cerner indication and stop dates, and pharmacist driven antimicrobial stewardship interventions. The two primary outcomes were the number of fluoroquinolones prescribed and overall days of therapy for fluoroquinolones in the treatment of UTIs. Secondary outcomes include empiric and final antibiotic prescribed, antibiotic de-escalation, length of stay, treatment failures and antibiotic related adverse events, including

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Clostridium difficile. For the primary outcomes, it was determined that 58 patients per treatment group would yield 80 percent power to detect a 20 percent difference for the number fluoroquinolones prescribed and a 90 percent power to detect a 1.7 day reduction in therapy. Statistical analysis performed were Pearson Chi-Square test or Fisher's Exact test for nominal data, two sample t-test for continuous variables (normally distributed data) or Mann-Whitney test for nominal and continuous variables (non-normally distributed data).

Results: There were no significant differences in baseline demographics between the two groups. For the primary endpoint of fluoroquinolone regimens prescribed, there was a statistically significant reduction from 40 percent to 17 percent of patients (P equals 0.013). For the primary endpoint of fluoroquinolone overall days of therapy, there was a statistically significant 41 percent reduction from a total of 110 days in the control group to 45 days of therapy in the intervention group (P equals 0.015). For secondary endpoints, there was a statistically significant difference in the percentage of patients prescribed an appropriate empiric antibiotic from 72 percent in the control group to 90 percent in the intervention group (P equals 0.03). There were no differences in the other secondary endpoints of antibiotic de-escalation within 48 hours, average duration of all antibiotic therapy, length of stay, treatment failure, *Clostridium difficile* or other antibiotic related adverse events.

Conclusion: This pharmacy-led antimicrobial stewardship initiative was associated with a statistically significant reduction in the overall use of and overall days of fluoroquinolones in the treatment of UTIs. The percentage of patients prescribed an appropriate empiric antibiotic also improved significantly. Key successes to this initiative included fluoroquinolone restrictions, education, Cerner indication stop dates and pharmacist interventions. Data found in this study had similar findings to other studies looking at antimicrobial stewardship initiatives for the treatment of UTIs, however, there are limited studies in hospitalized patients. Future studies are needed to determine the effects of these initiatives on uropathogen antimicrobial resistance rates.

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Session-Board # - 4-100

Poster Title: Reducing fluoroquinolone usage by partnering with the microbiology lab

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Guidelines for antimicrobial stewardship programs from the Infectious Disease Society of America recommend implementing interventions to reduce the use of antibiotics known to be associated with a high risk of *Clostridium difficile* infection as well as implementing cascade reporting of antimicrobial susceptibility test results. As a result of these recommendations, our antimicrobial stewardship program elected to suppress fluoroquinolone susceptibilities for organisms that are susceptible to narrower-spectrum agents. This study was conducted to assess the implementation of suppression rules for fluoroquinolone susceptibility reporting on fluoroquinolone usage.

Methods: Cascade reporting rules were reviewed. Where appropriate, fluoroquinolone susceptibilities were suppressed in our electronic health record (Epic) starting in January 2018. Vigilanz Clinical Pharmacist Workflow was used to collect data regarding antibiotic usage during the study period. To assess the efficacy of this intervention, fluoroquinolone usage was assessed during the first quarter of 2017 (pre-intervention period) as compared to the first quarter of 2018 (intervention period). Fluoroquinolone usage was recorded as Defined Daily Dosage (DDD) per 1000 patient days. All prescriptions for levofloxacin, ciprofloxacin and moxifloxacin were included in the study. Data for each month was compared using a student's t test. Finally, to adjust for potential differences in total antibiotic usage, fluoroquinolone use was compared to total antibiotic use per 1000 patient days. Our primary endpoint was a difference in fluoroquinolone DDD per 1000 patient days during the intervention period as compared to the pre-intervention period.

Results: Fluoroquinolone usage for the pre-intervention period was 39.05 DDD per 1000 patient days. This decreased to 27.51 DDD per 1000 patient days during the intervention period

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($p=0.1641$). An absolute difference of 11.54 DDD per 1000 patient days and a relative difference of 29.56 percent was detected. As compared to total antibiotic usage, fluoroquinolone usage decreased from 2.49 percent of total antibiotic usage to 1.79 percent of total antibiotic usage ($p=0.188$). This was a relative decrease of 28.03 percent.

Conclusion: Following this intervention, fluoroquinolone usage decreased in our facility by 29.56 percent. While not statistically significant, this decrease does show a trend that may be significant with a longer study period. This decrease in usage was immediate and sustained over the three month study period. It did not require any patient or provider-specific interventions. Additionally, this decrease was isolated in fluoroquinolone usage as our total antibiotic usage was relatively stable. While outside of the scope of this study, the maintenance of total antibiotic usage suggests that providers selected other, potentially less toxic and narrower spectrum antibiotics.

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Session-Board # - 4-101

Poster Title: Implementation of an antimicrobial stewardship program (ASP) in a 300-bed, acute care, teaching hospital: three years later

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Valley Hospital Medical Center's overutilization of broad spectrum antibiotics in addition to alarming rates of Gram-negative bacterial resistance, led to the implementation of an antimicrobial stewardship program (ASP) in 2015. The goals of the ASP service included monitoring and decreasing the inappropriate utilization of antimicrobials, decreasing specific antibiotic utilization by 20 percent, the year prior to ASP initiation; reducing hospital-onset *Clostridioides difficile* infection (CDI) rate by 50 percent as well as implementing fecal microbiota transplants; developing clinical pathways for common infectious disease states; and lastly, promoting physician education and prospective feedback. Biannual antibiograms were formulated to track resistance patterns.

Methods: The ASP service employed various interventions to accomplish these goals. The ASP committee, including ID physicians, developed and agreed on appropriate use criteria by which to measure appropriate use of antibiotics. The ASP pharmacist tracked and documented prescribing patterns for these antimicrobials. Prescribers who deviated from approved indications were contacted, offered alternative treatment options, and monitored for potential repeated incidences. Days of therapy (DOT) per a 1000 patient days was calculated to track overall utilization for each drug. To target fluoroquinolone prescribing, a laminated pocket size card was created and distributed to medical staff. These cards have one side illustrating appropriate use indications and on the opposite side an alternative treatment options table for common indications. In addition to this educational program, the ASP pharmacist reviewed patients on fluoroquinolone therapy on a daily basis to prospectively intervene on switching to

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alternative agents. Efforts to reduce hospital-onset CDI involved nursing and physician in-services conducted by the ASP pharmacist and residents. Antibiotics deemed to be high-risk for CDI were targeted and intervened on a daily basis. Jointly, the ASP committee, gastroenterology, and infection control staff created a protocol for fecal microbiota transplants for patients with recurrent CDI. Laminated cards detailing evidence-based treatment on several infectious disease states were also distributed. Lastly, antibiograms were formulated to track resistance rates.

Results: Three years of data have been collected, analyzed, and reported since the inception of the ASP service in 2015. The year 2014 was used as the baseline for comparison. Daptomycin, aztreonam, ertapenem, meropenem, ciprofloxacin, and levofloxacin DOT per a 1000 patient days has decreased by 58, 46, 94, 27, 31, and 80 percent, respectively, from 2014 to 2017. Overall usage of the carbapenems and fluoroquinolones decreased by 31 and 47 percent, respectively, from 2014 to 2017. Furthermore, overall antibiotic use decreased by 10 percent from 2014 to 2017. The incidence of hospital onset CDI per a 1000 patient days has decreased by 32 percent from 2016 to 2017. Previous years were not included due to differences in CDI testing methodology. The hospital has conducted 11 fecal microbiota transplants to present date. Resistance decreased for specific Gram-negative pathogens: carbapenem-resistant *Escherichia coli* and *Klebsiella pneumoniae* have decreased by 100 and 81 percent, respectively. Similarly, meropenem-resistant *Pseudomonas aeruginosa* has decreased by 86 percent, with three broad-spectrum antimicrobials exhibiting over 90 percent sensitivity rate. Recently, resistance of methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus faecium* have increased by 23 and 6 percent, respectively.

Conclusion: The Valley Hospital Medical Center's ASP service has successfully decreased utilization of antimicrobials during its first three-year period. Hospital-onset CDI rates have also decreased and eleven fecal microbiota transplants have been performed at the facility to present date. Gram-negative resistance patterns have shown a significant decrease while Gram-positive resistance patterns have trended up recently. Further trending and investigation into the increased Gram-positive resistance is being investigated in order to institute targeted interventions.

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Session-Board # - 4-102

Poster Title: Implementation of an antimicrobial stewardship program for nursing home patients

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: According to the CDC, antibiotics are frequently prescribed in the nursing home setting, with up to 70% of residents receiving one or more courses of systemic antibiotics when followed over one year. Studies have shown that 40-75% of antibiotics prescribed are unnecessary or inappropriate. Inappropriate antimicrobial use increases selection of resistant pathogens, increases adverse drug events, and creates collateral damage such as *Clostridium difficile* infections. The objective is to implement an antimicrobial stewardship program (ASP) to provide Infectious Disease support and promote appropriate evidence-based antimicrobial usage to optimize patient outcomes, minimize adverse events, and decrease the selection of resistant bacteria.

Methods: This is a descriptive study. To implement the program, leadership commitment and financial support were secured, nursing homes were visited, key stakeholders were identified, and an antimicrobial stewardship team for nursing homes was created. The program was started on 01/01/2016. Kaiser Permanente nursing home patients who were on antimicrobial, antifungal, and antiviral agents in the Kaiser Woodland Hills service area were included in the program. Prospective chart review with intervention and feedback was conducted. Infectious Disease consultation and education were provided to nursing home physicians and staff. There was collaboration between ASP pharmacists, Infectious Diseases physicians, nursing home physicians, and nursing home staff in managing patients' antimicrobial regimens. ASP interventions (approve, change, discontinue, and initiate) were tracked and reported quarterly.

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Readmissions from nursing homes for the following preset target diagnoses (sepsis, pneumonia, urinary tract infection, C. difficile colitis, and cellulitis) from 2015 were used as the pre-implementation benchmark.

Results: In 2016, ASP consulted 1125 patient antimicrobial regimens, of those regimens: 606 were approved, 303 were changed, 173 were discontinued, and 43 were initiated. In 2017, ASP consulted 1040 patient antimicrobial regimens, of those regimens: 612 were approved, 257 were changed, 126 were discontinued, and 45 were initiated. In 2015, 2016, and 2017, total number of patients were 1465, 1495, and 1378, respectively; total length of stay in days were 51208, 46239, and 45023, respectively. Readmission diagnoses were as follows in 2015, 2016, and 2017: Sepsis (50, 38, and 25), pneumonia (20, 9, and 2), urinary tract infection (10, 11, and 3), C. difficile colitis (3, 1, and 0), and cellulitis (1, 0, and 1), respectively. There was a 30% reduction in hospital readmissions with infection-related diagnoses resulting in 160 days of hospital cost savings in 2016 compared to 2015. There was a 65% reduction in hospital readmissions with infection-related diagnoses resulting in 338 days of hospital cost savings in 2017 compared to 2015. The total cost savings were estimated to be more than 5 times the cost of program operations.

Conclusion: The Antimicrobial Stewardship Program showed a significant positive impact on clinical and financial outcomes with lower rate of infection-related diagnoses for hospital readmissions. The program was well-received by all participants involved, particularly our nursing home physicians. The impact on antimicrobial resistance and collateral damage is yet to be determined. The program can serve as a best practice model for antimicrobial stewardship in the nursing homes.

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Session-Board # - 4-103

Poster Title: Does utilization increase when a brand name antibiotic goes generic?

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Although the primary goals of an antibiotic stewardship program (ASP) are to improve antibiotic utilization and decrease antibiotic resistance, ASPs may intentionally include policies to encourage the restriction of high cost drugs. When the generic version of the medication enters the market, it creates competition and results in lower drug prices which may ease ASP restriction status and potentially lead to increased utilization. The purpose of this study was to evaluate the impact of generic approval of previously brand name antibacterial drugs on total purchases and utilization.

Methods: This was a retrospective study that evaluated the relationship between drug purchases and utilization for antibacterial drugs that received their first generic drug approval between 2014 and 2017. Three drugs were included in the analysis: Cubicin (daptomycin, approved September 2014), Avelox (moxifloxacin; oral approved February 2014, IV approved May 2017) and Tygacil (tigecycline, approved May 2017). Purchase data was aggregated from pharmaceutical distribution data feeds and antibiotic utilization data was derived from a large database ((Clinical Data Base - Resource Manager (CDB/RM) (Vizient, Inc.)) for the period of January 2015 to March 2018. Generic and brand name purchasing and utilization trends were evaluated independently for each drug. They were also compared to drugs with a similar spectrum of antibacterial activity to evaluate if trends observed were unique to the individual drug or were a characteristic of the category/class. Purchase data fields evaluated included product name, trade size, total units, individual acquisition cost and aggregate spend. Antibiotic utilization data was measured based on days of therapy per 1000 patient days and was reflective of inpatient utilization only. Non-systemic antibiotics (e.g. topical) and 340b purchases were excluded. A paired t-test was used to determine a significant difference

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between the utilization and purchasing means before and after generic availability, or other underlying event, with a one-tailed p-value of 0.025 indicating significance.

Results: A total of 132 hospitals were included. Approximately 60.6% were academic medical centers and 39.4% were community hospitals. Total purchases for daptomycin, from the first quarter of generic availability (Q3/16) to the most recent quarter (Q1/18) decreased by 36.6%, while utilization during the same comparison periods increased by 6% ($p>0.025$). Utilization trends for daptomycin were similar to linezolid and vancomycin during the time period measured. For moxifloxacin, the largest decrease in purchases and utilization occurred between Q3/16 and Q1/18 (40.6% and 29.5%, respectively; $p>0.025$). However, a significant decrease in ciprofloxacin and levofloxacin utilization after the Food and Drug Administration (FDA) warning were observed ($p=0.004$ and 0.008 , respectively). For tigecycline, declines in total purchases were observed beginning in Q1/17. Overall purchases decreased by 19.2%, but utilization began decreasing in Q1/15 and was independent of generic status.

Conclusion: Varying magnitudes of reduction in overall quarterly purchases were observed for daptomycin, vancomycin, and tigecycline after generic availability. However, utilization remained relatively stable for daptomycin (alone and when compared to linezolid and vancomycin) and tigecycline during the period after generic availability. Changes in purchases and utilization for fluoroquinolones appeared to be a class effect and significant declines in ciprofloxacin and levofloxacin corresponded to the FDA fluoroquinolone warning in July 2016. Continued monitoring of generic and brand name antibiotic utilization and purchases should be evaluated to determine if these trends continue.

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Session-Board # - 4-104

Poster Title: Microbiological profile and escherichia coli resistance patterns in diabetic foot infections and urinary tract infections among Lebanese patients

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: The aim of this study was to characterize the bacterial profile of Diabetic foot Infections (DFI) and Urinary Tract infections and to assess the antibiotic sensitivity of the causative pathogens.

Methods: A retrospective, open-label, controlled study was performed at Raee hospital between January 2017 and April 2018 analyzing 254 patients (adults >18 years old) presented with either Diabetic foot infection (DFI) or Urinary tract infection (UTI). Main exclusion criteria were pregnancy and lactation. Materials used for microbiological evaluation for pathogen in DFI corresponded to curettage of the base of the ulcer after debridement, needle aspiration of the abscess material, or aspiration of material through the infected skin and deep tissues. UTI microbiological evaluation was done by obtaining a clean-catch midstream specimen or a suprapubic aspirate being collected in a sterile wide-mouth leak-proof container to hold about 50 ml specimen. The type of bacteria and the in vitro antimicrobial susceptibility of the E.coli isolated was determined by the Vitek machine method.

Results: A total of 254 samples (145 issued from the urine of UTI patients and 109 derived from the Pus of DFI patients) were screened for the contained pathogens and antibiotic sensitivity. The various pathogens detected in the cultures are shown and Staphylococcus coag. Negative (33.03%), followed by E.coli (27.52%) were the two most common organisms identified in the Pus derived from DFI patients .However, E. coli (73.10%)and Klebsiella (11.03%) were the two most frequent uropathogens.

In a second step, E. coli isolates, derived from 56 samples issued from the urine of UTI patients as well as from all the PUS samples issued from the DFI patients, were screened for antibiotic

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sensitivity using Antibiogram and MIC assays. The Antibiogram results revealed that the antibiotic efficacy in both UTI and DFI samples was not significantly different. Carbapenems (Ertapenem, Meropenem and Imipenem) followed by amikacin were the most effective antibiotics for E. coli eradication in both infections, while ceftazidime, cefepime and bactrim were the least effective antibiotics to eradicate E. coli. On the other hand, the incidence of resistance to fluoroquinolones (especially ciprofloxacin and levofloxacin) was around 50% of the cases. The MIC results were in accordance with the Antibiogram data.

Conclusion: We showed in this study that E. coli is among the most common bacterial species present not only in UTIs but also in DFIs. Moreover, E. coli showed significant resistance to different antibiotics.

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Session-Board # - 4-105

Poster Title: Impact of a small and rural hospital antimicrobial stewardship alliance on regulatory compliance

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: The most recent National Healthcare Safety Network survey regarding implementation of the Centers for Disease Control and Prevention Core Elements of Hospital Antibiotic Stewardship (AS) Programs reported less than 50% of critical access and hospitals with bed sizes less than or equal to 50 were compliant with all 7 elements. This demonstrated roughly a 45% variance compared to general acute care or larger hospitals. To bridge this gap, a small and rural hospital AS alliance (SARAA) was established December 2016 to provide expert AS consultation and resources. Investigators sought to assess regulatory compliance before and after formation of SARAA.

Methods: This was a multi-site survey assessing compliance with 18 regulatory elements for hospital and critical access hospitals antimicrobial stewardship programs (ASPs) before and after formation of SARAA. SARAA consisted of bi-monthly meetings regarding key regulatory areas for ASP implementation, collaboration with two infectious diseases pharmacists, and dissemination of ASP resources to assist with achieving regulatory compliance. An ASP survey was completed by 26 hospitals before (Dec16-June17) and after (Jul17-May 2018) formation of SARAA. Responses of present, not present, partially present, unknown, or exempt were collected. The workgroup focused on key drivers of low compliance based on pre-implementation survey results.

Results: Twenty-six CAHs completed the survey. In general, a 78% increase in compliance (present) with regulatory elements (68%+22 vs 38%+19) was experienced. Additionally, compliance increased from 58% (+22) to 83% (+16) when combining present and partially

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present responses in the post group. The largest percentage increase in present response was with leadership support, presence of a written policy and procedure, competency-based training, monitoring, tracking, and reporting for the ASP, and taking action on opportunities identified by the ASP. In the post group, greater than 75% compliance (present) was identified for leadership support, presence of a written policy and procedure, presence of a multidisciplinary committee, coordination with relative interdisciplinary members, physician and pharmacist leaders, multidisciplinary protocols, documentation of ASP activities. The top three needs (identified as greater than 25% replying “not present”) within the post group included: competency-based education of hospital personnel, ASP documents evidence-based use of antibiotics, and the ASP demonstrating improvement in proper antibiotic.

Conclusion: A standardized survey identified gaps in practice and recognized a critical need for antimicrobial stewardship support within the small and rural hospitals in our cohort. Implementation of a small and rural hospital antimicrobial stewardship alliance provided ASP resources and support which resulted in a significant increase in regulatory compliance.

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Session-Board # - 4-106

Poster Title: Risk of nephrotoxicity with the use of piperacillin-tazobactam: retrospective analysis in a community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Piperacillin-tazobactam (P-T), a commonly prescribed antibiotic in hospitalized patients, has been shown to be associated with acute kidney injury (AKI), both alone and in combination with vancomycin. Most of these studies have been done in larger, tertiary care hospitals. The purpose of this study was to determine the number of patients in a small (less than 100 bed) community hospital who suffer an episode of nephrotoxicity following initiation of P-T, both as monotherapy and in combination with vancomycin. This information will be utilized to develop hospital-specific guidelines to reduce the risk of AKI within the hospital.

Methods: This retrospective, quantitative, experimental study was approved by the University of Findlay Institutional Review Board (#1152). Hospitalized patients who were initiated on P-T between Jan. 1, 2015 and June 30, 2015 were identified via a drug use evaluation report generated by the hospital's IT department. The following patients (N=53) were excluded from further analysis: children (less than 18 years), pregnant women, those who received less than 72 hours (or 12 doses) of P-T, and patients with end-stage renal disease receiving dialysis. Most of the patients were excluded due to P-T courses that were less than 72 hours. Each electronic health record was reviewed and a standardized data collection form was completed for each patient who met study inclusion criteria. The following information was collected: patient demographics, reason for admission, presumed or documented infection site, admission and daily BUN and serum creatinine concentrations, white blood cell and platelet counts, vancomycin serum concentrations, microbiology results, all concomitant antibiotics, and total grams of P-T and vancomycin administered. AKI was defined as an increase in serum creatinine concentration of at least 0.3 mg/dL at any time during P-T therapy. Each data set was

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independently reviewed by each investigator and discrepancies were discussed until a consensus was reached.

Results: A total of 70 patients met inclusion criteria and were included in the data analysis. The study population consisted of 40 males (57.1%), the average study patient age was 70.4 years, the average length of hospital stay was 9.1 days, the average serum creatinine concentration at the time of hospital admission was 1.56 mg/dL, the average number of P-T doses received by each patient was 21.4, and 29 patients (41.4%) received concomitant vancomycin. Fifteen patients (21.4%) experienced one episode of AKI with or without the use of vancomycin. Seven of 41 patients (17.1%) experienced an episode of AKI while receiving P-T monotherapy; a total of 8 of 29 patients (27.6%) experienced an episode of AKI while receiving dual P-T plus vancomycin therapy. Upon hospital discharge, 50 patients (71.4%) had a lower serum creatinine concentration than at the time of admission, 12 patients (17.1%) had an increased serum creatinine between 0.01 and 0.29 mg/dL, and 8 patients (11.8%) had an increased serum creatinine of 0.3 mg/dL or greater. No study patients required any form of renal replacement therapy.

Conclusion: These results confirm studies that suggest P-T increases the risk of AKI in hospitalized patients and that this also occurs in community hospital patients who have been underrepresented in previous studies. These results also confirm that vancomycin further increases the risk of AKI in patients receiving P-T. Patients on dual therapy had a 61% increased risk of developing AKI vs. P-T monotherapy. These results support close monitoring of patients who initiate P-T (with or without vancomycin), especially in patients at higher risk of nephrotoxicity. This information will be utilized to further enhance the hospital's ongoing medication safety program.

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Session-Board # - 4-107

Poster Title: Assessment of an antimicrobial stewardship program one year after implementation in a community hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Due to widespread antimicrobial resistance, the Infectious Disease Society of America (IDSA), along with many other organizations, encourages establishment of antimicrobial stewardship programs (ASPs) in all healthcare settings. Following a multiyear planning process, including three background studies that assessed the pre-ASP usage of antibiotics within the hospital, a pharmacy-managed ASP was initiated at Wood County Hospital (WCH) in Bowling Green, Ohio in January 2017. The purpose of this study is to assess the effectiveness of the first year of the program through analysis of changes in antimicrobial usage rates, antibiotic costs, and pharmacist intervention activities.

Methods: This study was approved by the University of Findlay Institutional Review Board (#1188). This study population consisted of all WCH inpatients who had an antibiotic ordered in the electronic medical record between January 1 and December 31, 2017. Cost and usage data were gathered from WCH data bases utilizing only patient de-identified aggregate data. Clinical intervention data were collected and assessed via chart review. This program utilized a variety of methods recognized by the IDSA to improve and reduce antimicrobial usage, including therapy de-escalation, earlier discontinuation, and timely conversion of IV to oral therapy.

Results: Overall, from 2016 to 2017, there was an 8% decrease in total grams utilized of the following targeted antimicrobial agents: imipenem/cilastatin, meropenem, piperacillin-tazobactam, cefepime, levofloxacin, ciprofloxacin, vancomycin, and linezolid. When adjusted

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for grams utilized per 1000 patient-days, there was an overall decrease of 5.6% from 2016 to 2017. The largest usage decreases occurred with cefepime, levofloxacin, vancomycin, and linezolid. Overall, antibiotic costs decreased by \$10,417 from 2016 to 2017. While not all of this is directly attributable to the ASP, more detailed analysis suggests that 60-70% of these savings are due to the ASP. Total antibiotic costs per patient-day decreased from \$8.13 in 2016 to \$7.34 in 2017. Month-by-month analysis shows that reductions in the use of piperacillin-tazobactam and vancomycin were highest in the last six months of 2017, suggesting the program became increasingly effective as the year progressed and pharmacists became more comfortable in formulating and making interventions. A total of 197 recommendations (16.4 per month) were made through the ASP and 158 (80.2%) were accepted. The majority of these interventions (60.2%) focused on therapy de-escalation.

Conclusion: A pharmacist-managed ASP program in a community hospital was well received, as evidenced by the 80.2% acceptance rate for ASP recommendations. More than half of those recommendations resulted in de-escalation of therapy, interventions most likely to reduce antibiotic use and limit the selection of resistant organisms. Over \$9,000 of the annual cost savings occurred between May and December, suggesting the effectiveness of the program increased as the year progressed. It is expected that this ASP will become more effective in coming years as both pharmacists and providers become more comfortable with the goals and objectives of the ASP.

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Session-Board # - 4-108

Poster Title: Cost-benefit of inpatient pharmacist administered penicillin allergy skin testing

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Penicillin is one of the most common patient-reported allergies. About 10 percent of the population report a penicillin allergy, however when allergy testing is employed, the true allergy rate is around 1 percent. A penicillin allergy label may alter provider antibiotic choices leading to the avoidance of beta-lactam antibiotics, which may cause increased antibiotics costs and side effects. The purpose of this study was to review penicillin allergy skin testing (PAST) in this institution to determine time requirement and cost-benefit, if any, based solely on antibiotic costs.

Methods: Data was collected on the first 200 patients that received PAST from December 2013 to July 2016. Testing was physician ordered and pharmacist administered to adult inpatients. Data collected included antibiotics prior to PAST and after PAST, including readmissions, up until the end of July 2016. Actual antibiotic costs were compared to estimated alternative antibiotics costs for initial and subsequent cost savings. Estimated antibiotic costs were compared to actual alternative antibiotic costs for preceding cost savings. A cost-benefit analysis was performed to determine the primary outcome of initial cost savings and secondary outcomes of subsequent and preceding cost savings. A time study was also performed.

Results: PAST revealed 170 (85 percent) negative, 23 (11.5 percent) positive and 7 (3.5 percent) indeterminate tests. 129 of the 170 were challenged with a beta-lactam antibiotic, none of which had an immediate allergic reaction. Initial antibiotics cost savings were 15,995.62 dollars with a cost of performing the test at 16,708.00 dollars. Subsequent antibiotics treatment cost

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savings were 17,851.94 dollars. Preceding cost savings were 12,197.67 dollars. Total realized cost savings were calculated to be 17,139.56 dollars. PAST on average took 45.4 minutes to perform.

Conclusion: The use of PAST in this specific institution realized cost savings not on the initial admission but with subsequent admissions. As would be predicted cost savings will continue to grow with time. PAST was also able to be completed within a reasonable amount of time.

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Session-Board # - 4-109

Poster Title: Implementation of a meropenem dose optimization protocol in a long-term acute care hospital

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: As of January 1st, 2017, hospitals are required to meet the Antimicrobial Stewardship Standard MM09.01.01 for accreditation. Long-term acute care hospitals (LTACs) fall under the hospital designation for The Joint Commission. LTACs are often challenged with limited resources for implementing antibiotic stewardship and clinical pharmacy protocols. Dose optimization is a recommended strategy by national guidelines as well as the Centers for Disease Control and Prevention (CDC) Core Elements of Hospital Antibiotic Stewardship programs to improve antibiotic use. The purpose of this study was to evaluate the effectiveness of a meropenem dose optimization protocol in an LTAC.

Methods: This was a single center, retrospective study comparing meropenem utilization before (September – December 2017) and after (May 2018) implementation of a dose optimization protocol in a 45-bed LTAC. A meropenem dose optimization for conversion of 1 gram every 8-hour dosing regimens to 500 mg every 6 hours was approved by the Pharmacy and Therapeutics Committee and implemented in May 2018. Education was provided to nursing, case management, physicians, and pharmacists. The dose optimization was performed upon order entry during pharmacy open hours, 8:00am to 4:30pm Monday through Friday, and 9:00am to 3:00pm on Saturdays. A retrospective chart review was performed to determine meropenem doses administered as well as utilization, which was defined as defined daily dose per 1000 patient days (DDD/1000PD).

Results: Post-implementation, roughly a 27% increase in the number of patients administered meropenem 500 mg was experienced [75% (9/12) vs 59% (35/59)]. Additionally, a 39%

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reduction in mean (+SD) meropenem DDD/1000 PD occurred [96 vs 156.5(+62.5)] which corresponded to a 15% decrease in mean (+ SD) monthly expenditure [\$1,606.60 vs \$1,889.90 (+386.38)].

Conclusion: Implementation of a meropenem dose optimization protocol in a LTAC resulted in a decrease in DDD/1000PD and an increase in the number of patients receiving 500 mg versus 1 gram doses of meropenem.

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Session-Board # - 4-110

Poster Title: Health economic value of plazomicin versus colistin in the treatment of carbapenem-resistant enterobacteriaceae bloodstream infections: a cost-effectiveness analysis

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Bloodstream infections (BSI) due to carbapenem-resistant Enterobacteriaceae (CRE) are increasing with an estimated rise from 1.2 percent in 2001 to 4.2 percent in 2011. The clinical and economic burden is significant with about \$66,000 and 1 quality-adjusted life year (QALY) lost per CRE BSI patient hospitalization. The economic value of plazomicin, an aminoglycoside, for the potential treatment of BSI due to CRE has yet to be determined. The purpose of this study was to develop an economic model to estimate the cost-effectiveness of plazomicin-based versus colistin-based regimens in the treatment of CRE BSI using the head-to-head clinical trial evidence

Methods: A deterministic decision tree model was designed with a lifetime horizon from a health system perspective assuming 3 percent annual discounting on efficacy and costs. The model incorporated clinical efficacy from a Phase 3 trial including bacteremia clearance at Day 5 (85.7 percent and 46.7 percent for plazomicin and colistin, respectively) to inform the risk of subsequent treatments and extended hospitalization days. Additionally, 28-day all-cause mortality (7.1 percent and 40 percent for plazomicin and colistin, respectively) was used to estimate a daily probability of death during the hospitalization period. Other clinical inputs included treatment duration observed in the clinical trial as well as assumptions on subsequent treatment regimens and duration of treatments among those failing initial therapy on either plazomicin or colistin-based regimens. Economic inputs included hospital-specific treatments based on wholesale acquisition cost, therapeutic drug management, and cost per day in the

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hospital (analysis of National Inpatient Sample database, \$2,770 per day). Other economic inputs included future healthcare costs (\$10,137 per year) to capture the post-discharge economic burden of those patients surviving the CRE BSI infection hospitalization (all costs adjusted to 2017 USD). The primary model outcomes included the incremental cost-effectiveness ratio (ICER) defined as the cost per QALY gained. Additional outcomes and analyses were performed from the hospital perspective including the cost per death avoided and the total costs of the hospitalization period only.

Results: Based on a range of assumed treatment costs for a plazomicin-based treatment regimen, it was estimated that plazomicin is cost-effective and well within acceptable willingness to pay thresholds of \$50,000 to \$150,000 per QALY gained. The total life expectancy calculated with plazomicin versus colistin was about 5 years resulting in a discounted incremental QALY gain for plazomicin versus colistin of 1.38 years. Based on an assumed range of plazomicin prices, the ICER was estimated to range from about \$9,000 to about \$17,000 per QALY gained. From a hospital perspective, plazomicin estimated treatment costs were offset by the downstream costs of subsequent treatments and the associated extended length of stay resulting in cost savings to the hospital. Sensitivity and scenario analyses demonstrated the findings were robust to the key drivers including mortality, treatment cost, and cost per hospital day.

Conclusion: From a lifetime health system perspective, plazomicin is estimated to be cost-effective versus colistin for the treatment of CRE BSI with an ICER well within a willingness to pay thresholds of \$50,000 to \$150,000 per QALY gained.

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Session-Board # - 4-111

Poster Title: Health economic value of plazomicin versus meropenem in the treatment of complicated urinary tract infections including acute pyelonephritis: cost-effectiveness analysis

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Complicated urinary tract infections (cUTI), including acute pyelonephritis (AP), are common infections that can result in inpatient hospitalizations. Inappropriate antibiotic selection in the management of cUTI/AP can result in additional healthcare burden due to treatment failures from empiric treatment and the risk of relapse. Plazomicin is an aminoglycoside being developed for the treatment of cUTI and other serious bacterial infections, including those due to multidrug-resistant (MDR) Enterobacteriaceae. The purpose of this study was to develop an economic model to estimate the cost-effectiveness of plazomicin versus meropenem in the treatment of cUTI/AP using the head-to-head clinical trial evidence.

Methods: A deterministic decision tree model was designed with a lifetime horizon from a hospital-perspective assuming 3 percent annual discounting on efficacy. The model incorporated clinical efficacy from the Phase 3 registrational trial including clinical cure rates at the test of cure timepoint for the microbiologically modified intent-to-treat population (81.7 percent and 70.1 percent for plazomicin and meropenem, respectively) to inform the risk of subsequent treatments and extended hospitalization days. Additional data included relapse rates post discharge (1.8 percent and 7.9 percent for plazomicin and meropenem, respectively). Mortality was based on published literature assuming 1.8 percent among treatment successes and 7.2 percent treatment failures. Other clinical inputs include the use of the treatment duration observed in the clinical trial and assumptions on subsequent treatment regimens and

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duration among those failing initial therapy on either plazomicin or meropenem. Economic inputs were specific to the hospital-perspective and included treatment costs based on wholesale acquisition cost, therapeutic drug management, and other hospital costs using an average cost per day in the hospital. All costs were adjusted to 2017 USD. The primary model outcomes included the incremental cost-effectiveness ratio (ICER) defined as the cost per quality-adjusted life year (QALY) gained. The cost per clinical cure was also estimated as an alternate outcome. Sensitivity and scenario analyses were performed to assess the robustness of the model to uncertainty in model inputs.

Results: Assuming a range of plazomicin treatment costs, the ICER without including future healthcare costs was estimated to be about \$14,000 to about \$23,000 per QALY gained. Across a range of assumed plazomicin prices, the cost per clinical cure ranged from about \$20,000 to about \$22,000 while meropenem was estimated at about \$21,000. Despite higher assumed treatment costs evaluated for plazomicin, the benefits of plazomicin versus meropenem on clinical cure rates and clinical relapse resulted in offsetting most of the estimated treatment costs for plazomicin.

Conclusion: From a lifetime hospital perspective, plazomicin is calculated to be cost-effective versus meropenem for the treatment of cUTI/AP with an ICER well within a willingness to pay threshold of \$50,000 to \$150,000 per QALY gained. In addition, the cost per clinical cure for plazomicin is estimated to be cost-competitive to meropenem for the treatment of patients hospitalized with cUTI/AP infections.

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Session-Board # - 4-112

Poster Title: De novo hepatocellular carcinoma (HCC) and HCC recurrence in hepatitis C virus patients treated with oral direct-acting antiviral and interferon-based regimens

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Opposing findings in the literature yield uncertainty whether or not direct-acting antiviral (DAA) hepatitis C virus treatment (HCV) treatment regimens are associated with an increased rate of de novo hepatocellular (HCC) or HCC recurrence. Historic interferon (IFN)-based regimens were safe to use in non-cirrhotic patients and patients with compensated cirrhosis, but new DAA regimens are also safe to use in patients with decompensated cirrhosis. Investigators will assess de novo and recurrent HCC rates by HCV regimen type (IFN- or DAA-based).

Methods: The institutional review board approved this single center, retrospective cohort study. Investigators reviewed electronic medical records of patients who started HCV treatment with IFN- or DAA-based regimens under the care of the clinical pharmacist at an urban academic medical center between June 1, 2009 and March 1, 2017. Baseline patient data collected included patient age at initiation of HCV treatment, gender, race/ethnicity, genotype, fibrosis stage, and Child-Turcotte-Pugh class in cirrhotic patients. HCV-specific data included prior treatment history, HCV treatment regimen, dates and duration of therapy, and lab values. HCC-specific data included prior HCC treatment history, date of complete radiologic response, and date of de novo or recurrent HCC. Patients who were treated with both IFN- and DAA-based regimens were excluded. The primary outcome was HCC occurrence or recurrence in each cohort. The secondary outcome was sustained virologic response (SVR) after HCV treatment. Clinical characteristics were described with counts and percentages for categorical variables, and means with standard deviation for continuous variables. Comparisons between baseline characteristics of the two groups were done with t-tests for continuous variables and

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chi square or Fisher's exact tests for categorical variables. Data were analyzed with Stata version 9 software.

Results: Inclusion criteria were met by 894 patients. 26 percent (25/96) of the IFN group versus 49 percent (289/595) of the DAA group were cirrhotic at baseline (p value less than 0.001). A total of 20 cases of HCC were diagnosed after HCV treatment completion: 3 percent (3/96) in the IFN group, and 2 percent (11/595) in the DAA group. HCC recurrence did not differ between groups; it was diagnosed in no patients in the IFN group versus 6 patients in the DAA group (0 percent versus 1 percent, p value equal to 0.32). Time to recurrence in the DAA group was 2.8 years (interquartile range 2.3–3.5). De novo HCC also did not differ between groups; it was diagnosed in 3 patients in the IFN group versus 11 patients in the DAA group (3.1 percent versus 1.9 percent, p value equal to 0.41). Time to de novo HCC in the IFN versus DAA groups was 3.2 and 1.7 years, respectively (interquartile range 0.4–5.5 versus 1.3–2.7). 73 percent (58/96) in the IFN group achieved SVR at 24 weeks after HCV treatment completion, and 86 percent (514/595) in the DAA group achieved SVR at 12 weeks.

Conclusion: De novo and recurrent HCC in patients treated with DAA regimens was not increased compared to IFN-based regimens in this patient population. A larger proportion of cirrhotic patients were treated with DAAs, which have a more tolerable safety profile compared to IFN-based regimens. This study further supports several studies that found no increased risk of HCC recurrence with DAA regimens. This study is limited by its retrospective design.

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Session-Board # - 4-113

Poster Title: Evaluation of renal and bone and safety in patients with CHB and chronic kidney disease treated with tenofovir alafenamide in post liver transplantation

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: chronic hepatitis B (CHB) remains a leading indication for orthotopic liver transplantation (OLT) worldwide. Common complications following OLT include renal dysfunction secondary to perioperative renal injury and postoperative nephrotoxicity from calcineurin inhibitors; osteoporosis is also observed secondary to preoperative malnutrition and post-operative corticosteroids. In this setting, antiviral prophylaxis to prevent recurrent HBV infection with tenofovir alafenamide (TAF) may have advantages over tenofovir disoproxil fumarate (TDF) due to its improved renal and bone safety profile.

Methods: In this Phase 2 study (NCT02862548), liver transplant recipients with stage 2 or greater chronic kidney disease and receiving antiviral prophylaxis with TDF were randomized 1:1 to either receive TAF 25 mg QD or continue their TDF containing regimen. The primary efficacy analysis was the percent of patients who maintained viral suppression at Week 24. Key pre-specified secondary safety endpoints were changes in hip and spine bone mineral density (BMD), changes in serum creatinine (sCr), estimated GFR by CKD-EPI formula and direct GFR assessment (Chromium- EDTA Renal Scan; Cr-EDTA) over 48 weeks.

Results: 51 patients were randomized and treated at a single site in New Zealand. Baseline characteristics included: mean age 60 years, 75% males, 53% Pacific Islander and mean baseline eGFRCKD-EPI 52mL/min/1.73m² with 53% of patients with <50mL/min/1.73m². The median baseline surface area corrected GFRCr-EDTA was 58 mL/min/1.73m². The median interval since

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transplantation was approximately 9 years. Seventy-six percent of patients were maintained on tacrolimus and 29% remained on long-term prednisone. Of the 47 patients that have reached Week 12 to date, all patients (25 in TAF; 22 in TDF arm) maintained viral suppression. There were no treatment discontinuations and serious adverse events were numerically lower in TAF arm compared to the TDF arm. Switching to TAF treatment resulted in a trend toward improved sCr levels (median change in mg/dL: -0.07 for TAF vs. -0.02 for TDF; $p=0.09$) and improved eGFRCKD-EPI (median change in mL/min/1.73m²: 2.7 for TAF vs. 0.8 for TDF; $p=0.14$) as early as week 12. Complete data including changes in bone parameters at week 24 will be available at the time of the presentation.

Conclusion: Early after switching from TDF to TAF in a liver transplant recipient population with high rate of renal dysfunction, viral suppression is maintained while smaller changes in renal function were observed.

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Session-Board # - 4-114

Poster Title: Utilizing days of therapy per 1000 patient days to further develop an antimicrobial stewardship program on a transition of care unit

Poster Type: Descriptive Report

Submission Category: Infectious Disease / HIV

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Purpose: Antimicrobial use in the long-term care setting or at transitions of care requires a thorough review to reduce unnecessary antimicrobial days of therapy. Extended antimicrobial exposure leads to increased risk for resistance, clostridium difficile associated diarrhea, adverse drug events, and hospital readmissions. Analysis of our institution's days of therapy (DOT) per 1000 patient days metric revealed an overall 20% increase in DOT per 1000 patient days for oral anti-infective agents for the entire institution from 2016 to 2017.

Methods: Days of therapy per 1000 patient days for 2017 was analyzed by both hospital unit and anti-infective agent. Our transition of care unit (TCU) became an area of focus after chart reviews revealed a lack of stop dates for anti-infective agents upon transfer. Pharmacy also lacked a formal antimicrobial review process for TCU admissions. A policy and procedure for daily review of antimicrobials on all TCU patients was developed and implemented. This process change requires the pharmacist to review all anti-infective agent indications, signs and symptoms of an active infection, and culture results. Due to lack of a dedicated antimicrobial pharmacist, education was provided to all pharmacists. Additionally, a standardized pharmacy note was implemented to ensure all pharmacists were compliant with the procedure and workflow. Retrospective data for both oral and intravenous (IV) DOT per 1000 patient days was collected for TCU for 2017. Prospective data was collected from January 2018 to May 2018 with ongoing data collection as part of a performance improvement project. In addition, we are monitoring the most utilized IV and oral anti-infectives to determine if our interventions show a reduction in DOT per 1000 patient days.

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Results: Pharmacists were educated on the procedure for antimicrobial review for all TCU patients and proper documentation of the intervention. As a result, TCU IV DOT per 1000 patient days has decreased on average by 53 percent. In addition, a 25 percent reduction in oral DOT per 1000 patient days has been observed. Among the targeted oral and IV anti-infective agents; we have seen the following reductions in DOT per 1000 patient days: amoxicillin-clavulanate 17 percent; cephalexin 25 percent; ciprofloxacin 25 percent; ceftriaxone IV 37 percent; meropenem IV 55 percent; vancomycin IV 42 percent.

Conclusion: Surveillance of antimicrobial stewardship programs utilizing days of therapy per 1000 patient days may help reduce unnecessary exposure to antimicrobials and decrease cost without affecting patient outcomes, especially on transfer to a transition care unit or external care facility. Continued area of improvement includes a future electronic medical record enhancement requiring a stop date on all anti-infective agents at transitions of care.

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Session-Board # - 4-115

Poster Title: Referral source matters: hepatitis C cascade of care for traditional versus emergency department referrals

Poster Type: Evaluative Study

Submission Category: Infectious Disease / HIV

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Purpose: Hepatitis C (HCV) is a known epidemic, with chronic disease and acute infections increasingly recognized. Innovative screening strategies to best identify undiagnosed disease are necessary to combat the epidemic. While current guidelines advocate for age cohort and risk factor-based screening, there is growing interest in universal screening. Evaluation of such screening models on the HCV cascade of care (CoC) is needed to adequately assess the impact of similar programs. We examined CoC completion rates among patients referred from an emergency department (ED)-initiated universal HCV screening program, compared to patients referred to HCV treatment from traditional sources.

Methods: We conducted a single-center, cohort study of patients with chronic HCV with a scheduled appointment in the Vanderbilt University Medical Center (VUMC) Infectious Diseases Clinic. Two cohorts were analyzed: patients referred through traditional sources with an appointment between September 2015 and July 2016; and patients referred through the VUMC ED screening program between December 2016 and April 2018. Patients currently receiving ongoing HCV care or who had not been deemed lost to follow-up at the time of analysis were excluded. The primary outcome was CoC progression, defined as the number of stages completed in the CoC. Steps in the CoC included: referral; linkage to care (i.e., attendance at scheduled appointment); evaluation (i.e., completion of labs and imaging); prescription of therapy; initiation of therapy; completion of therapy; and achievement of a sustained virologic

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response. Baseline demographic data were collected for all patients at time of referral. Additional demographic, health, and social characteristics were measured for patients linked to care. Chi-square tests were conducted to compare demographic characteristics between cohorts. Using multivariate linear regression, we tested whether CoC progression was predicted by cohort (traditional vs. ED referral), patient demographics (i.e., gender, ethnicity, baby-boomer age group), and social and health characteristics (i.e., HIV diagnosis, psychiatric disorder, alcohol abuse, illicit drug use). Both cohorts received care from the same multidisciplinary providers and were treated based on HCV therapeutic guidelines.

Results: Overall, 369 patients met inclusion criteria—183 in the ED cohort and 186 in the traditional cohort. Among all patients referred to care, the ED cohort had more uninsured patients (22% vs. 5%, $p<0.001$), and fewer patients in the baby-boomer age group (38% vs. 53%, $p=.003$) than the traditional referral cohort. Lower prevalence of HIV was also seen in the ED cohort (2% vs. 41%, $p<0.001$), among patients linked to care. One-third of referred patients (33%) completed all CoC stages across cohorts, but completion rates were significantly lower in the ED cohort (7%) versus traditional (56%). Across cohorts, the largest drop within the CoC occurred between referral and linkage to care; however, this was more pronounced in the ED cohort, with only 27% of ED patients attending an initial scheduled visit compared to 77% of patients in the traditional cohort. In the multivariate analysis of patients linked to care, CoC progression was higher in baby boomers ($\beta=0.22$, $p=0.003$) and patients with HIV ($\beta=0.18$, $p=0.020$), and lower among patients in the ED cohort ($\beta=-0.27$, $p<0.001$) and those with Medicaid insurance ($\beta=-0.26$, $p<0.001$).

Conclusion: In this single center cohort study, patients referred through a universal ED screening program varied significantly from traditional referral sources, with fewer patients in the baby-boomer age cohort, more uninsured patients, and fewer patients with commercial insurance. In both univariate and multivariate analyses, the ED cohort had lower CoC completion rates than those referred through traditional methods, with the largest drop seen between referral and linkage to care. Optimizing the impact of universal ED screening programs hinges on ensuring linkage to care after referral for HCV treatment.

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Session-Board # - 4-116

Poster Title: Pharmacokinetic-pharmacodynamic relationship observed with the investigational extended-release, non-opioid analgesic HTX-011

Poster Type: Evaluative Study

Submission Category: Pain Management / Palliative Care

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Purpose: The currently available liposomal formulation of bupivacaine has not shown a pharmacokinetic-pharmacodynamic (PK-PD) relationship between plasma bupivacaine concentrations and reduction of postoperative pain. HTX-011 is an investigational, non-opioid local analgesic with bupivacaine as the active ingredient and low-dose meloxicam in a proprietary 72-hour extended-release (ER) formulation. The addition of meloxicam is designed to reduce local inflammation associated with surgery (which lowers pH and can reduce the effectiveness of bupivacaine). We compared the rate of absorption of bupivacaine from HTX-011 and PD activity, represented by pain reduction compared to saline placebo, in two Phase 2 clinical trials across different surgical models.

Methods: The PK-PD relationship of bupivacaine was evaluated in two Institutional Review Board-approved, randomized, blinded, Phase 2 dose-finding trials in patients undergoing primary unilateral first metatarsal bunionectomy or unilateral open inguinal herniorrhaphy with mesh placement. Each patient provided informed consent and at the end of surgery received HTX 011 via instillation (bunionectomy: 60 mg bupivacaine; herniorrhaphy: 200 mg bupivacaine) or saline placebo. In addition, an active control of ER bupivacaine alone in the same proprietary formulation and dose (HTX-002) was included in each study. Patients remained in the hospital for protocol-specified assessments of pain intensity for 72 hours post-treatment and received opioids as rescue medication for pain control, when requested. A correlation between the plasma concentration of bupivacaine and pain control was analyzed by

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plotting the rate of absorption of bupivacaine against the difference in the curve of pain intensity scores over 72 hours between saline placebo and treatment groups. A conservative windowed worst observation carried forward (wWOCF) imputation method in the modified intent-to-treat population was employed. Full PK profiles were obtained in all patients, including blood draws at numerous timepoints through 72 hours.

Results: The analysis included: in the first study, 52 HTX-011 patients vs 23 HTX-002 patients vs 103 saline placebo patients undergoing a bunionectomy; in the second study, 16 HTX-011 patients vs 13 HTX-002 patients vs 60 saline placebo patients undergoing a herniorrhaphy. Demographic characteristics were comparable within each study. When HTX-011 was administered into the surgical site, there was a high degree of correlation between the difference in pain score and the calculated rate of absorption of bupivacaine from HTX-011 over time. In contrast, no correlation was seen with the single agent product HTX-002. Patients who received HTX-011 undergoing bunionectomy exhibited significantly lower AUC₀₋₇₂ of the numeric rating scale (NRS) for pain intensity than those who received saline placebo ($p=0.0003$) or HTX-002 ($p=0.0333$), despite HTX-002 having a similar bupivacaine release profile to HTX-011. Patients who received 200 mg of HTX-011 after undergoing herniorrhaphy also showed significantly lower AUC₀₋₇₂ for the NRS of pain intensity than those who received saline placebo ($p=0.0180$) or HTX-002 ($p=0.0333$). Thus, the results were consistent across both surgical models, despite differences in vascularity and anatomical space.

Conclusion: The results suggest evidence for HTX-011 as the first ER bupivacaine to show a consistent PK-PD correlation. This correlation was not demonstrated with the single agent product HTX-002. HTX-011 also demonstrated prolonged analgesic activity consistent with the extended release of bupivacaine and meloxicam. These results were replicated with two different doses in two different surgical models of varying vascularity.

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Session-Board # - 4-117

Poster Title: Self assessment of neuropathic pain treatment among patients with cervical or lumbar radiculopathy in Lebanon

Poster Type: Descriptive Report

Submission Category: Pain Management / Palliative Care

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Purpose: Spinal disorders, including cervical or lumbar radiculopathy due to disc compression are common causes of neuropathic pain. There is a lack of evidence about medication efficacy in relieving radiculopathy induced pain. The Self-Assessment of Treatment version II (SAT II) measures treatment-related improvements in pain and impacts and impressions of treatment in neuropathic pain patients. The purpose of this study is to assess the pharmacological treatment efficacy using the SAT II and patient global impression of change (PGIC) questionnaires.

Methods: This is an observational prospective study carried out in 30 community pharmacies across Lebanon. All adult patients diagnosed with radiculopathy and receiving pharmacological pain treatments were screened. Subjects were interviewed at baseline (first pharmacy visit) for demographics, clinical data, SAT and PGIC scores. The SAT items included assessments after treatment for two areas (pain relief; impact on activity level and quality of life) and two additional items regarding (1) whether the patient would undergo the treatment again, and (2) a comparison of the study treatment to previous treatments for pain. The PGIC evaluation included a score from 1 (no change) to 7 (great deal better) of how the patient can describe the change in activity and symptoms related to pain. Patients were included only if their baseline pain score on SAT was moderate, severe or very severe (greater or equal to zero). Exclusion criteria included subjects with other pain conditions and those with cognitive impairment. Patients were followed up at weeks 4, 8, and 12 to assess response to treatment by filling SAT and PGIC follow up versions. Study subjects were receiving either pregabalin monotherapy (group A) or a combination of two or more drugs (nonsteroidal anti-inflammatory drug (NSAID),

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Vitamin B complex, and topical agents) (group B). The primary efficacy endpoint was the mean change in SAT-II and PGIC from baseline to week 12.

Results: 138 patients were included in this study of whom 57.1% were females. Mean age was 48.5 years. Group A was composed of 52 subjects and group B of 86. The SAT II baseline characteristics were not significantly different between the two groups. At week 12, the “SAT pain” follow up item mean in Group A was 0.54 versus -0.2 in group B ($P=0.037$), the “SAT impact” follow up item mean in group A was 3.62 versus -0.2 in group B ($P<0.01$). PGIC was 5.62 in group A versus 4.97 in group B ($P=0.034$). “Better and definite pain improvement” on PGIC has been reported in 61.5% of group A and 39% of group B. In Group A, 45.8% of patients responded “yes, probably” to a question if they would like to receive the treatment again and 33.3% responded “yes, definitely”, whereas 37% and 10.3% responded as such in group B, respectively. In Group A, 50 % of patients responded “very much better” to a question how does the study treatment compared to other treatments you have received, whereas 23.4% responded as such in group B.

Conclusion: Anticonvulsant monotherapy in the management of radiculopathy induced neuropathic pain achieved 20-30% improvement in pain relief and impact of pain on activities and quality of life while combination treatments failed to achieve any response.

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Session-Board # - 4-118

Poster Title: Use of opioids before and after common elective surgical procedures: An analysis of Aetna fully insured commercial and Medicare populations

Poster Type: Descriptive Report

Submission Category: Pain Management / Palliative Care

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Purpose: Opioids are the current standard of care to manage acute postsurgical pain, but they are associated with burdensome and costly adverse events. There are concerns that exposure to opioids before surgery can lead to prolonged use after surgery. Real-world data are fundamental to understanding the use of opioids before and after common elective surgical procedures.

Methods: This was a retrospective analysis of medical and pharmacy claims for patients aged 18 years or older in Aetna fully insured commercial health plans or Medicare Advantage plans who underwent 10 common elective surgical procedures between January 1, 2014, and December 31, 2016: total knee arthroplasty (TKA), total hip arthroplasty (THA), total shoulder arthroplasty (TSA), lumbosacral fusion (LF), cesarean section (CS), hysterectomy, colorectal resection, hernia repair, vertical sleeve gastrectomy (VSG), and cholecystectomy. Coverage was required at least 2 months before and at least 12 months after the date of surgery. Categorical variables were summarized as counts (percent) and proportions were compared using chi-square analysis.

Results: A total of 95,125 patients met eligibility criteria; 64,251 (68 percent) had information on the type of postsurgical analgesia used (eg, neuraxial/regional/local analgesia, opioids) and were included in the analyses. The most common surgical procedure was cholecystectomy (n equals 13,999), followed by CS (10,569), TKA (10,341), hysterectomy (9,542), hernia repair

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(8,996), THA (5,950), colorectal resection (4,220), LF (3,091), VSG (1,711), and TSA (1,625). Overall, 13,356 patients (21 percent) filled an opioid prescription within 30 days presurgery; 63,390 (99 percent) had a claim for intraoperative opioids, 28,319 (44 percent) filled an opioid prescription within 30 days postsurgery, and 11,750 (18 percent) continued to do so 31 to 60 days postsurgery. LF had the highest proportion of patients with prescription opioids within 30 days presurgery (45 percent), while CS had the lowest (3 percent). TKA had the highest proportion of patients with prescription opioids in the 30 days postsurgery (77 percent); LF had the highest (48 percent) for 31 to 60 days postsurgery. The proportion of opioid use in the 30 days postsurgery was significantly higher in patients receiving opioids within 30 days presurgery (LF: 79 vs 59 percent; TKA: 25 vs 13 percent; each, P less than 0.05).

Conclusion: Use of prescription opioids before surgery was common among a large cohort of adult patients undergoing elective surgical procedures. Almost all patients undergoing surgery received opioids at the time of surgery, and a substantial proportion continued to use them within the first 60 days after surgery. More research is needed to understand the short- and long-term health and economic consequences of perioperative opioid use and to evaluate approaches aimed at minimizing the use of opioids for postsurgical analgesia.

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Session-Board # - 4-119

Poster Title: Optimizing patient care by utilizing a pharmacy technician in ambulatory settings

Poster Type: Descriptive Report

Submission Category: Pharmacy Technicians: Competencies/Development/Other

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Purpose: For many decades, healthcare systems have utilized the role of Pharmacy Technicians under the supervision of Pharmacists in hospitals to increase the efficiency of Pharmacists, add value to patient care, and reduce costs. Since Pharmacy Technicians have been effective in medication reconciliation in the inpatient and emergency departments, this study explores the potential to utilize them in the ambulatory setting. The purpose of this study is to evaluate the adherence rates and the ability of a Pharmacy Technician to support the Pharmacist in an ambulatory setting to optimize patient care.

Methods: In February 2018, a Pharmacy Technician was hired to support a Pharmacist in the ambulatory setting. Prior to the hire, the Pharmacist followed adherence for all Horizon Blue Cross Blue Shield patients; that responsibility thereafter shifted. 69 Horizon patients who see an Inspira Medical Group Primary Care Provider, had an adherence rate for both Quarter Four 2017 (10-1-2017 to 12-31-2017) and Quarter One 2018 (1-1-2018 to 3-31-2018). One tail, paired t-test explored the effect of a Pharmacy Technician on patient's adherence rates. In addition to adherence, the Pharmacy Technician also reviews patients with Chronic Kidney Disease to evaluate if they are eligible for care management. Both the Pharmacist and Pharmacy Technician receive patients to care manage through an identification/attrition algorithm, provider/nurse referral and from the payer. To monitor performance, cases are split into two groups, Pharmacy Care and Chronic Kidney Disease. All Chronic Kidney Disease cases should be managed by the Pharmacy Technician, giving the Pharmacist more time to spend on patients with 8 or more prescriptions. A one-tail, paired t-test was conducted to assess if there

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was a significant difference in the four months prior to the Pharmacy Technicians arrival compared the past four months.

Results: There was an overall 1.4% increase in adherence rates among Horizon patients during the 3-month timespan. However, the increase was not significant with a p value of 0.14. From October 2017 to January 2018, the Pharmacist had more cases (515 cases) and spent more time (2,249 minutes) with the sum of these patients compared to the four months with the Pharmacy Technician. We did not find a significant difference in the time that was spent before and after the Pharmacy Technician ($p=0.07$), but there was a significant difference in the number of cases that the Pharmacist was able to see ($p=0.05$). Even though, the Pharmacist saw less cases in the months with the Pharmacy Technician, the Pharmacist spent on average 5.15 more minutes with each patient.

Conclusion: Pharmacy Technicians have the clinical background in medication adherence to work with patients in all settings. By utilizing the Pharmacy Technician in ambulatory settings, the Pharmacist can maximize their clinical expertise providing optimal patient care.

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Session-Board # - 4-120

Poster Title: Increased emergency department order processing by using remote support staff

Poster Type: Descriptive Report

Submission Category: Pharmacy Technicians: Competencies/Development/Other

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Purpose: A critical access hospital in Washington state sought to improve quality patient care and increase safety by turning off nursing override privileges to their automated dispensing machines (ADMs). They also set a goal of 15 min turnaround time (TAT) for STAT orders although the expectation of the emergency staff is 10 minutes or less. Since the hospital pharmacy department is not open 24/7, telepharmacists are utilized overnight when the pharmacy is closed. This poster will demonstrate how remote telepharmacy support staff is utilized to maintain quick order turn around and support the hospital patient safety initiative goal.

Methods: The emergency department (ED) at Mason General Hospital has an average of twelve hundred medication orders each month verified by after hours telepharmacists. Due to the urgency of drug administration in the ED, medications can be removed from the ADMs without prior review by the pharmacist (override). In April 2017, a patient safety initiative was started that requires a pharmacist review of all ED medication orders prior to administration. A soft go-live to turn off the override function of the ADMS began in April 2017. Pharmacists were required to complete the review of the ED orders within five to fifteen minutes. Between the hours of 1730 to 0700, remote telepharmacist take over the order review while the on-site pharmacy department is closed. A quick assessment showed that telepharmacists were not able to meet the quick order turnaround time due to their high workload. To avoid a decrease in standard of care, telepharmacy support specialists (TSS) were recruited to help. TSS are Nationally Certified pharmacy technicians working remotely to assist telepharmacists serving multiple facilities. TSS were given view only access to pending orders from the ED and notified the telepharmacist of the pending orders. Data collected and reviewed are from April 2017 to April 2018.

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Results: The average order turnaround time by a telepharmacist for processing ED orders at Mason General Hospital during the first phase of the project was 12 minutes with the goal being 5 to 10 minutes. This was below TAT expectations of the ED staff. A change was made during the second phase of the project to allow the TSS to have access to pending orders entered by the ED prescriber. The TSS would immediately notify the pharmacists of the pending orders. This process resulted in a TAT of less than 4 minutes. On average, the telepharmacists reviewed 20 orders each hour. Having the requirement that a medication order has to be reviewed by a pharmacist before administration ensures the drug is appropriate for the patient. Pharmacists are able to ask questions on drug allergies and clarify drug doses and regimens with the prescriber prior to the drug being administered by the nurse. Other pharmacist interventions included renal adjustment, kinetic dosing and monitoring as well as anticoagulation recommendations. The turn around time of less than 4 minutes has exceeded the expectations of the hospital ED and pharmacy staff.

Conclusion: The patient safety initiative was executed successfully and the prevention of drug administration prior to a pharmacist review in the ED has improved patient safety. The integration of the telepharmacy support staff improved order review and turnaround time by the after hours telepharmacists. Emergent orders were prioritized to ensure they are reviewed thoroughly prior to administration. This has now become the new standard of care for the ED at Mason General. A quick turnaround time and complete review of each ED order by a telepharmacist makes this workflow a consideration for other facilities seeking to improve drug administration safety.

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Session-Board # - 4-121

Poster Title: Implementation of a pharmacy validation technician program

Poster Type: Descriptive Report

Submission Category: Pharmacy Technicians: Competencies/Development/Other

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Purpose: A validation technician program in an acute care hospital can be used to redirect pharmacists from drug distribution to provide more clinical interventions. Pharmacy technicians who accept the validation technician role must have requisite education and proper supervised training. Allowing the validation technician to check medications filled by another technician, specifically medications being delivered to automated dispensing cabinets. The creation of the validation technician role provides an additional incentive by expanding their roles and responsibilities. Through the authority of the state board, the validation technician accepts responsibility and accountability for stocking and prepackaging functions in an acute care hospital pharmacy.

Methods: Before implementation of the validation technician program, Moses Cone reviewed the rules and regulations from the North Carolina Board of Pharmacy (21 NCAC 46.1418). The rules states that a pharmacy technician may validate if the following criteria is met: technician has an associate's degree in pharmacy technology, conferred by an institution within the North Carolina community college system, regional accrediting agencies recognized by the United States Department of Education, or accredited by ASHP, PTCB-certification; and registered with the North Carolina Board of Pharmacy. A pharmacy manager developed the didactic training competency to be completed prior to being placed into the validation role. Validation technicians are required to score 90% on the assessment questions and demonstrate proficiency in practical tasks. For the initial validation, the technician must attain a 99.8% accuracy rate in checking no less than 1,500 doses across a minimum of five audits. Upon completion of the competency exam, the pharmacy technician can begin checking. A safety measure and quality assurance process need to be in place. Safety measures used at Moses

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Cone include: barcode scanning all medication into and out of the carousels, when refilling the automated dispensing cabinets, and bedside barcode scanning medication at time of administration. All medication errors are reported as adverse drug events. For the quality assurance process, a pharmacist performs random unannounced audits on the validation technician's work.

Results: In a 12 month window, with two validation technicians, medication errors, stock outs, and waste were decreased. The validation technician checks 80% of the medication fills (87-94% of medications are located in the automated dispensing cabinets for the units that are cartless), with a 99.8% accuracy checking rate (documented by the monthly audits). This allows for the pharmacist(s) more time to perform clinical functions to provide the best optimal patient care possible.

Conclusion: With proper safeguards, pharmacy technicians have established themselves as capable partners in the medication dispensing process. The validation technician program provides career development opportunity for pharmacy technicians. The program allows the pharmacists to focus on optimal patient care. The results show that it is ideal for a qualified pharmacy technician to validate stocking and prepackaging functions in an acute care hospital.

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Session-Board # - 4-122

Poster Title: Impact of continuous professional pharmacy development at Hamad Medical Corporation, Qatar

Poster Type: Descriptive Report

Submission Category: Professionalism and Career Development

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Purpose: In a changing and increasingly complex profession, lifelong learning is essential for pharmacists and pharmacy technicians. The Continuous Pharmacy Professional Development Office (CPPD) at Hamad Medical Corporation (HMC) is keen on providing efficient CPD opportunities that serves the concept of professional development for pharmacy professionals in Qatar. Being accredited by Qatar Council of Healthcare Practitioners and the American Council Pharmacy Education (ACPE), HMC is seeking to measure the impact of CPD on knowledge and daily practice of pharmacy professionals.

Methods: A cross-sectional survey was developed based on literature review. Participants were pharmacists and pharmacy technicians currently practicing at Hamad Medical Corporation hospitals in Qatar. The survey consisted of a total of 13 questions which assessed quality of educational activities, impact of the CPD process and attitudes towards the implemented program. In this study, two sections were reported in the methodology. The first is how an efficient CPD system is implemented across a large healthcare entity such as HMC. The second is how the impact of this system was measured. The quality of educational activities were measured by: indicating learning objectives and covering them comprehensively, presentation skills of the speaker, time and venue of activities, assessment method and being free of commercial bias.

Results: A total of 126 responses were collected, 80% were pharmacist and 20% were pharmacy technicians. The majority of the respondents agreed that CPD has positively

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impacted their knowledge (81%), increased their confidence and performance in daily practice (75%) and has encouraged them to pursue further learning opportunities (79%). On the other hand, some (7.5%) respondents reported that the CPD process is not smooth which led to some changes in the application process. Participants reported that lack of time is the biggest barrier to education at 61%. This was followed by: accessibility (41%), cost of participation (32%) and lack of relevant topics (17%). In addition, many suggested to provide more application based activities such as workshops.

Conclusion: Pharmacists and pharmacy technicians have positive attitudes towards the CPPD program in HMC. Currently, the CPPD Office has implemented a plan to overcome the current and anticipated barriers to CPD. It is important to measure the impact of CPD on healthcare outcomes which is a plan in progress in affiliation with ACPE.

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Session-Board # - 4-123

Poster Title: Current status of residency-trained pharmacists in Saudi Arabia

Poster Type: Evaluative Study

Submission Category: Professionalism and Career Development

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Purpose: The number of residency-trained pharmacists is increasing in Saudi Arabia, either by graduating through national (Saudi) residency programs or through international (USA and other) residency program. In Saudi, the general clinical pharmacy diploma is a two-year residency training program (R1 and R2) that is qualifying the postgraduate year-one (PGY-1) pharmacy residency program in the United States. On the Other hand, Saudi certificate in clinical pharmacy is a third-year pharmacy residency program (R3) that is qualifying the postgraduate year-two (PGY-2) pharmacy residency program. The purpose of the study is to describe the post-residency clinical pharmacy practice in Saudi Arabia.

Methods: A survey study with 24 questions was sent to all pharmacists who had completed pharmacy residency training, either nationally or internationally and currently practicing clinical pharmacy in Saudi Arabia. This questionnaire was built electronically and distributed through phone applications and social media. The survey was active for one month. The questionnaire was validated by a faculty member in the faculty of pharmacy at King Abdulaziz University. The data collection was done via fourth-year pharmacy students. The data analysis was then done using Excel Microsoft 2013.

Results: A total of 48 responses were received. Of them, 16 pharmacists have completed (PGY-1) residency training, and 13 have completed (PGY-2) residency training in the United States. In the national programs, 19 pharmacists have completed the general clinical pharmacy diploma (R1 & R2), and 16 pharmacists have the Saudi certificate in clinical pharmacy (R3). Seventeen

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pharmacist work in academic hospitals. Also, 75 % of them are practicing clinical pharmacy in their area of specialty. Interestingly the most of them have work experience of 1 to 5 years after completing residency training. The top three specialties responding to this survey are cardiology, organ transplant, and infectious diseases.

Conclusion: The current status of post-residency training is promising by increasing the number of trained pharmacists who provide direct patient care. Increasing the residency-training sites for more training opportunities is highly demanded in Saudi Arabia

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Session-Board # - 4-124

Poster Title: Perceived stress and discrimination among working pharmacist moms

Poster Type: Evaluative Study

Submission Category: Professionalism and Career Development

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Purpose: The extent and determinants of job satisfaction have been topics of considerable interest to the pharmacy profession over the last decades. Pharmacy practice is often faced with significant pressures from a wide variety of sources. In 2016, 61 percent of PharmD degrees were awarded to women pharmacists, many of who were also mothers. The objectives of this study are to 1) determine stress levels amongst working pharmacist moms 2) ascertain if these moms felt discriminated against in the workplace.

Methods: A Facebook Pharmacist Moms (PM) group was founded 2017. In order to be approved as a member of this group, moms were screened through a series of questionnaires. PM group members were then invited to complete a pilot 18 question online survey which was open for 60 days. The survey included stress, discrimination, and demographic-related questions. The stress-related survey questions were derived from a previously published study. This study was IRB approved.

Results: Ninety-three pharmacist moms responded to the survey. The majority (82 percent) of respondents graduated greater than 5 years ago. Most (81 percent) had at least two children; 44 percent had one or more children less than 5 years old. Fifty-eight percent of respondents practiced in retail pharmacy, 25 percent in hospital and 12 percent in academia. Moms who worked in retail felt more upset because of something that happened at work compared to non-retail moms (63 percent versus 28 percent $p=0.0015$). Retail pharmacist moms also felt

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more nervous or stressed about work (70 percent versus 49 percent, $p=0.0014$) and were more likely than non-retail mothers to feel difficulties were piling up so high they could not overcome them (48 percent versus 15 percent, $p=0.001$). We found no differences in any of the stress questionnaires when we compared the pharmacist moms who graduated less than 5 years ago vs more than 5 years ago. There were no significant findings regarding workplace discrimination.

Conclusion: Pharmacist moms working in retail report higher stress levels compared to their non-retail counterparts. These findings suggest a larger survey to determine stress perceived by pharmacist moms is warranted. Women have become a major force in pharmacy and play a significant role in the future of the profession. These results highlight the importance of educating pharmacy students about stress in their upcoming careers. Pharmacy curricular education should include coping skills, particularly for female students, and may also incorporate life management techniques that foster a healthy work-life balance in moms.

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Session-Board # - 4-125

Poster Title: Implementation of a pharmacy technician training program within a multi-hospital healthcare system

Poster Type: Descriptive Report

Submission Category: Professionalism and Career Development

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Purpose: To explain the process taken to design and implement a pharmacy technician program within a multi-hospital health system. The goal of the program is to prepare future technicians by promoting confidence, leadership, and professional skills in order to optimize patient outcomes through interdisciplinary medication management. The manner in which is to “learn” in a classroom environment, “practice” through simulated labs, and “do” in actual patient-centered pharmacies to improve a student’s knowledge and skills in the area of pharmacy.

Methods: Representatives from Human Resources and pharmacy administration were assembled to develop program framework using the ASHP Accreditation Standards for Pharmacy Technician Education and Training Programs as a guide. An Advisory Committee was established from this cohort. An internal review was conducted to determine the number of open positions and the number of technicians hired by the health-system from 2015-2016. From these figures, technician turnover rates were calculated and a business plan was developed to justify program need and to establish funding for hiring a Pharmacy Technician Training Coordinator. Additionally, these figures were used to project future workforce needs, and to determine the number of classes offered per year, as well as class size. Upon review of similar programs, tuition cost was established as \$3800 per student and student agreements were finalized in regards to a 1 year work commitment in lieu of tuition payment. The Advisory Committee developed an application process along with criteria for admission, including a

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prescreening mathematics examination and criteria for successful program completion. Program advertising was initiated, a proposed curriculum combining didactic, simulation and experiential components based on ASHP Accreditation Standards was developed, teaching faculty was established and a student training manual was authored. Once the business plan was approved, recruitment and hiring of a program coordinator was completed and the first class of 7 students commenced in September, 2017.

Results: Enrollment was opened with the criteria of passing a math exam and going through an interview process, nineteen candidates applied in the first round. A total of seven candidates were chosen through this process to start the class in September 2017. In the first cohort, 100% graduated from the program. All seven students successfully registered with BOP, five remained within the health system and two were hired as pharmacy technicians at an outside location. The second round of enrollment had fifteen applicants. Out of those candidates, six were chosen to start in February 2018. This cohort is currently in the second semester and has begun experiential training on site at the different locations. Enrollment for the next cohort is open, at this time there are twenty applicants. This cohort is scheduled to start class in July 2018.

Conclusion: The implementation of a pharmacy technician training program within a multi-hospital healthcare system was a successful initiative that provides a pool of well trained, graduating technicians who are ready to fulfill the needs of the health system. Implementation of the training program was achieved through a coordinated effort that included the health system's administrative support to establish a new program, a program coordinator who was committed to running a successful program, preceptors who were eager and willing to teach and train as well as marketing the program within and outside of the health system to find quality candidates.

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Session-Board # - 4-126

Poster Title: Preparing pharmacy students to respond to ethical dilemmas encountered in practice using the format of an interdisciplinary ethics quiz bowl

Poster Type: Descriptive Report

Submission Category: Professionalism and Career Development

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Purpose: The World Health Organization advocates for interprofessional education (IPE) inclusion into curriculums for all health care students. The Accreditation Council for Pharmacy Education mandates the incorporation of meaningful IPE into pharmacy school curriculums. IPE prepares students to provide futuristic health care that is evidence-based, patient-centered, standardized, reliable, efficient, and equitable. IPE focuses on developing student skills for team-based practice in four competency areas: values/ethics, roles/responsibilities, interprofessional communication practices, and interprofessional teamwork. We designed this pilot to provide students with an opportunity to apply ethical principles within a format of IPE to prepare them for APPEs and future practice.

Methods: The ethics quiz bowl was modeled on the National High School Ethics Bowl. Participating health care disciplines submitted health-care focused cases and edited them to enhance their applicability to all participating specialties. Faculty acted as judges and moderators. Teams were assigned and students received the potential ethical case scenarios and contact information for their teammates approximately 2 weeks before the actual quiz bowl and could choose to prepare together if they desired but this was not mandatory. All teams were comprised of students from multiple disciplines and had 6-8 team members. Students and faculty from pharmacy, sonography, and nuclear imaging, occupational therapy, and physician assistant programs participated. Teams received their actual cases for the first time at the opening round and had 3 minutes to read the case and determine their ethical position. Judges scored each match and the winning teams were determined by combining rounds won and scores in individual rounds. A survey evaluating the Quiz Bowl was distributed

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to all students who participated. The survey consisted of four questions using a 5-point Likert scale and two short-answer questions. The survey evaluated the student's perceptions of the IPE. Descriptive statistics were used to evaluate overall effectiveness of the IPE and scores by discipline are being compared to determine if any significant differences exist between disciplines.

Results: Seventy-seven students signed-up to participate in the Ethics Quiz Bowl. Seventy-one students participated and returned evaluative surveys (92%). Overall, 88% of students agreed that the quiz bowl was a good format for IPE and 76% believed that the time they used to participate was worthwhile. Additionally, 77% of students agreed that they learned worthwhile information on the application of ethical principles to their future health care practice and 75% of students agreed that we should repeat the ethics quiz bowl the following spring. In general, occupational therapy and pharmacy students were more positive in their responses than physician assistant and imaging students. Students generally felt the event was well organized and appreciated the interdisciplinary approach. Physician assistant students had more criticisms and suggestions for future programs than other disciplines. Opportunities for improvement identified by students included scheduling, preparation for students not concurrently involved in ethics didactics, and more preparatory contact with faculty and fellow teammates. Although cases had been developed and adjusted to be universally applicable to all participating health care disciplines, some students felt that they were not applicable to their practice.

Conclusion: For health care providers to collaborate effectively and improve health outcomes, they must be provided with opportunities as students to collaborate with other disciplines prior to and during their advanced practice rotations. The barriers and logistics around developing IPE programs can be formidable but equally formidable are the potential benefits to students who graduate with the skills necessary to work in a patient-centered collaborative health care environment. Student attitudes toward the opportunity to participate in an IPE focused on common ethical issues encountered within their professional practice were overwhelmingly positive and the program will be continued in spring 2019.

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Session-Board # - 4-127

Poster Title: Impact of student involvement on attainment of an initial interview for postgraduate training programs in a graduating class of P4 pharmacy students

Poster Type: Evaluative Study

Submission Category: Professionalism and Career Development

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Purpose: As competition for postgraduate residency and fellowship positions increases, students have attempted to diversify their time and efforts during pharmacy school. While placement in these positions is often related to interview performance, attainment of the initial interview itself is often determined solely by application materials, which largely depict a candidate's level of involvement during their professional years of pharmacy school. Due to lack of available literature on this topic, this study was designed to evaluate how students allocated time across various modalities during pharmacy school to see if this directly correlated with obtaining an initial interview for a postgraduate position.

Methods: An anonymous survey, composed of 45 questions, was administered to graduating pharmacy students at a single institution during their weeklong board preparation program. This survey assessed each students' time allocation among various activities during the professional years of pharmacy school. The survey assessed average number of hours spent per week during the P1 to P4 years in the following activities: paid work, professional pharmacy organizations, and non-pharmacy organizations. Also recorded in the survey was the setting in which students worked, the number of pharmacy organizations involved with, the number of leadership positions held within these organizations, and involvement with research activities throughout the P1 to P4 years. The number of applications and interviews as well as the acceptance rates for both residency and fellowship programs for each applicant was also assessed. Student data was divided into 3 groups: those who applied to residency or fellowship

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programs and/or entry level positions. To determine if a students' level of activity throughout the professional years of pharmacy school correlates to being offered an interview for a fellowship and/or residency program, the students data within each of these groups was quantified and subsequently compared between those who were offered an interview and those who were not. Trends in data were assessed between groups to evaluate any correlations that may have occurred.

Results: A total of 237 graduating PharmD students completed this survey. Eighty four students applied for postgraduate training (21 for fellowship programs, 69 for residency programs and 6 to both). Among applicants, 71 were offered interviews: 19 (90.5 percent) for fellowship and 52 (75.4 percent) for residency programs. Six (28.5 percent) fellowship applicants and 23 (44.2 percent) residency applicants who received an interview had a Grade Point Average (GPA) greater than 3.5 compared to 4 (23.5 percent) residency applicants who did not receive any interviews. Of those who attained at least one interview, 26.3 percent of fellowship and approximately 30 percent of residency applicants performed research during the P3 and/or P4 years compared to 17.6 percent of residency applicants who did not receive any interviews. Regarding leadership roles within professional pharmacy organizations, approximately 50 percent of all applicants offered at least one interview (residency or fellowship) held one or more position(s) during the P2 and/or P3 year compared to approximately 37 percent of residency applicants that did not receive any interviews. Of those offered at least one interview for postgraduate programs, 38 were offered positions: 9 (42.9 percent) attained a fellowship position and 29 (42.0 percent) attained a residency position.

Conclusion: This study suggests that there are multiple variables that may influence a candidate's chance of being offered an interview during the application process for residency or fellowship programs. Among other factors, the likelihood of attaining an interview appears to not only be correlated to achieving a higher GPA but also to other activities including membership and increased level of involvement in professional pharmacy organizations, leadership roles within these organizations and participation in research. Based on these results, students should continue to seek additional opportunities outside the academic environment to be considered strong candidates for these increasingly competitive positions.

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Session-Board # - 4-128

Poster Title: Potential risk of herb-drug interactions during pregnancy: a cross-sectional survey

Poster Type: Descriptive Report

Submission Category: Women's Health

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Purpose: Women are the major users of herbal and natural products (HNP) for treatment of disease and maintenance of health, and this widespread use also extends into pregnancy. Pregnant women are routinely prescribed medicines while self-medicating with herbal natural products to treat predominantly pregnancy related conditions. Approximately 40% of UK pregnant women use HNP to treat pregnancy related problems such as nausea and vomiting or as nutritional supplements to aid fetal development. The aim of this study was to assess the potential for herb-drug interactions (HDIs) in pregnant women and to explore possible herb-drug interactions and their potential clinical significance.

Methods: Data assessing the use of CAM collected from women attending for their mid-trimester (18–21 weeks) scan (n=332) and women, within the first 24 hours following a live birth, admitted to the postnatal unit (n=557) at the Royal Aberdeen Maternity Hospital, North-East Scotland were combined. Questionnaires were given to women attending the antenatal clinic for their mid trimester scan or on the postnatal ward following delivery. The questionnaire was tested for face and content validity by a panel of healthcare professionals, pregnant and postpartum women. The questionnaire contained four sections comprising: health and medication use during pregnancy ; use of CAM therapies ; attitudes toward CAM use during pregnancy ; and demographics . To help participants to identify correctly the products or modalities considered as herbal or natural products a check list was provided from the Medicines and Healthcare-Products Regulatory Agency . The potential for herbal and natural product interaction with prescribed medicines was assessed using the Natural Medicines Comprehensive Database. Data were coded and entered into an SPSS 22.0 database.

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Descriptive statistics were used to analyse the data and provide respondent profile. Chi-square was used to test the associations between age, education and the use of herbal or natural products; $p < 0.05$ was considered statistically significant. Received ethic approval from National Health Service North of Scotland Research Ethics Committee.

Results: The survey was completed by 889 respondents (73% response rate). 45.3% (403) reported the use of at least one prescription medicine, excluding vitamins. Of those taking prescription medicines, 44.9% (181) also reported concurrent use of at least one HNP (Range 1-12). A total of 91 different prescription medicines were reported by respondents using HNPs. Of those taking prescription medicines, 44.9% (181) also reported concurrent use of at least one HNP (Range 1-12). Thirty-four herb-drug interactions were identified in 23 (12.7%) women with the potential to increase the risk of postpartum haemorrhage, alter maternal haemodynamics, and enhance maternal/fetal CNS depression.

Almost all were rated as moderate (93.9%), one as a potentially major (ginger and nifedipine) and only one minor (ondansetron and chamomile). The prescribed drug classes with the potential for interaction with HNP were antithrombotic agents (7), antihypertensive agents (6), antidiabetic agents (5), hypnotics and anxiolytics (4), opiate analgesics (4), NSAIDs (3), hormonal therapies (2, prevention of miscarriage), proton pump inhibitors (1), insulin (1) and anti-emetics (1).

Conclusion: In the UK, HNPs are used by almost half of pregnant women, although most are unaware that they are using herbal medicines. While many HNPs contain active ingredients, which have the potential to interact with prescribed medication either directly or indirectly. Almost half of pregnant women in this study were prescribed medicines excluding vitamins and minerals and almost half of these used HNPs. Potential moderate to severe HDIs were identified in an eighth of the study cohort. Healthcare professionals should be aware that the concurrent use of HNPs and prescription medicines during pregnancy is common and carries potential risks.

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Session-Board # - 4-129

Poster Title: Multi-center prospective study of breast cancer screening knowledge, attitude and practice in hospital employed Lebanese women

Poster Type: Evaluative Study

Submission Category: Women's Health

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Purpose: Breast cancer is the most commonly diagnosed cancer in women living in Western countries as well as the Middle East and North Africa (MENA) region. Breast cancer screening modalities which are Self Breast Examination (SBE), Clinical Breast Examination (CBE) and mammographic imaging are powerful tools that help with the early detection of the disease, thus allowing patients a better chance at complete remission using the least aggressive treatments. The aim of this study was to assess the knowledge, attitude and practice (KAP) of breast cancer screening methods among hospital employed Lebanese women.

Methods: The study was a seven months, multicenter, prospective trial concerned with breast cancer screening methods. Researchers obtained IRB approval from six different hospitals in rural (four sites) and urban (two sites) regions. Information sheets were distributed and informed consents were signed by all participants. Women aged 20 years or older and employed at the included centers as nurses, physicians, pharmacists, accountants, administrative officers, cleaning services or others, were included. Patients with history or current diagnosis of breast cancer were excluded. Assessment was done using a modified version of the validated Breast Cancer Awareness Measure (CAM) questionnaire. The questionnaire was comprised of 75 questions and was self-completed by participants under the supervision of the researchers. The questionnaire included sections about: demographic data, infant delivery, health habits, patient and family history, breast cancer knowledge, breast cancer screening modalities, attitude towards breast cancer screening and barriers to seeking medical help. For data input and analysis SPSS (statistical package for social science) version 21 was used. Standard deviation, 95 percent confidence interval and P value were calculated. Chi-

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square test, T-test and ANOVA tests were used for comparisons between different subsets of participants. For all analysis, significance was set at $p < 0.05$.

Results: Among two hundred distributed questionnaires, 104 females completed the study. Seventy eight percent of the participants were employed in the medical field. There was a clear correlation between educational level and age groups ($p = 0.0001$) and between work status and age groups ($p = 0.001$). Around 62 percent of the participants answered correctly 4 or more questions (out of 7) regarding knowledge of symptoms; implying adequate symptoms knowledge. Whereas only 41 percent of the participants answered correctly 7 or more questions (out of 14) regarding knowledge of risk factors, implying poor risk factors knowledge. Chi-square studies of individual questions with work status/education level showed no correlation ($p > 0.05$). Despite having good knowledge about breast cancer screening methods, women in our study had low levels of practice. The most commonly practiced screening method was CBE (seventy nine percent). Only twenty one percent of the participants had undergone mammographic screening, due to the fact that participants' mean age was 32 years, hence not requiring mandatory mammography. The most common barriers that prevented women from undergoing screening were embarrassment of visiting a physician (sixty one percent) and fear of visiting a physician (approximately fifty seven percent).

Conclusion: Lebanese women require more awareness campaigns. The Ministry of Health and the employing hospitals have a responsibility in highlighting the dangers of late diagnosis of breast cancer, and the benefits screening modalities provide when practiced in the right way and at the correct frequency. Health care professionals need to encourage women to partake in breast cancer screening and improve their attitude towards the practice by limiting all possible barriers that prevents them from seeking medical help.

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Session-Board # - 7-001

Poster Title: Clinical and financial outcomes for a multidisciplinary chronic obstructive pulmonary disease (COPD) clinic – 2 years of experience

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

Primary Author: Britt Cummins; Pharmacy Systems Inc (Memorial Hospital);

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Purpose: National data shows high correlation linking medication non-adherence and poor inhaler technique to increased morbidity and mortality from chronic obstructive pulmonary disease (COPD). Suboptimal choices related to lifestyle, exercise, and smoking are also contributing factors to high rates of hospital admissions and emergency room visits and increased morbidity and mortality. High admission rates for COPD were identified as an opportunity for improvement. Pharmacy proposed and developed a multidisciplinary COPD clinic to identify and implement clinical strategies aimed at reducing hospital admission rates and improving clinical outcomes for patients with this disease.

Methods: In January 2016, the pharmacy implemented a multidisciplinary COPD clinic to focus on medication management and healthy lifestyles. Patients are managed by a clinical pharmacist-nurse practitioner team. Patients are seen by both team members at every visit with medical decision-making reached through close clinical collaboration. The pharmacist member of the team emphasizes medication monitoring, management and education with the nurse practitioner focusing on physical examination and clinical assessment. Patient referrals to the COPD Clinic come from both primary care and specialty providers. Another source for referrals is a transitions-of-care clinic. Medication management focuses on comprehensive medication review/reconciliation, titration of medications, patient medication and disease education, emphasis on proper inhaler technique, implementation of customized medication plans and tools to optimize medication adherence, and financial assistance assessment. In addition to medication management, the clinical team emphasizes educating patients about healthy lifestyle choices, dietary counseling, exercise, and pulmonary rehabilitation. The following outcomes were measured at baseline for each patient and tracked throughout a 2

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year period: hospital admission and emergency room visit rates, percentage of patients who have quit smoking, Medication interventions were also tracked as well as financial metrics.

Results: This evaluation involved 40 patients over the 2 year period resulting in 441 months of patient management (equivalent of 38 patient years). There were 173 medication interventions (2.43/patient). Hospital admission rates decreased by 72% during the clinic's first two years compared with what these patients experienced during the 12 month period prior to their referral. The rate of emergency room visits decreased by 27%. The percentage of patients who stopped smoking increased from 19% at baseline to 47% after smoking cessation interventions. Based on management of 40 patients during this 2-year period, the COPD Clinic achieved a net financial benefit of \$905,740 dollars per year. The COPD clinic currently manages 72 patients and the net financial benefit is projected to be \$1.63 million per year based on present volumes. The financial benefit is largely derived from cost savings with reduced hospital admissions and emergency room visits.

Conclusion: A comprehensive approach to optimizing medication usage and adherence in COPD along with interventions focused on healthy lifestyle improved clinical outcomes and reduced disease exacerbations. Medication non-adherence is a frequent contributing factor to treatment failure with COPD. Medication adherence and effective inhaler technique are cornerstones of therapy. The best care plan often fails when patients struggle with carrying out medication aspects of their therapy. A more comprehensive approach to medication management and adherence should be a top priority for health care organizations. Pharmacists working in collaboration with physicians and midlevel providers can achieve significant improvements in clinical outcomes for COPD.

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Session-Board # - 7-002

Poster Title: Clinical and financial outcomes for a multidisciplinary heart failure clinic – 3 years of experience

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

Primary Author: Britt Cummins; Pharmacy Systems Inc (Memorial Hospital);

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Purpose: National data shows high correlation between medication non-adherence and morbidity and mortality from heart failure. Suboptimal choices related to lifestyle, diet, exercise, and stress can also significant contributing factors to high rates of hospital admissions and emergency room visits and increased morbidity and mortality from this disease. High admission rates for heart failure were identified as an opportunity for improvement. Pharmacy proposed and developed a multidisciplinary heart failure clinic to identify implement clinical strategies aimed at reducing hospital admission rates and improving clinical outcomes for patients with heart failure.

Methods: In the fall of 2014, the pharmacy implemented a multidisciplinary Heart Failure Clinic to focus on medication management and healthy lifestyles. Patients are managed by a clinical pharmacist-nurse practitioner team. Patients are seen by both team members at every visit with medical decision-making reached through close clinical collaboration. The pharmacist member of the team emphasizes medication monitoring, management and education with the nurse practitioner focusing on physical examination and clinical assessment. Patient referrals to the Heart Failure Clinic come from both primary care and specialty providers. Another source for referrals is a transitions-of-care clinic. Medication management focuses on comprehensive medication review/reconciliation, titration of medications, patient medication and disease education, implementation of customized medication plans and tools to optimize medication adherence, and financial assistance assessment. In addition to medication management, the clinical team emphasizes educating patients about healthy lifestyle choices, dietary counseling, exercise, and cardiac rehabilitation,. The following outcomes were measured at baseline for each patient and tracked throughout a 3 year period: hospital admission rates, percentage of

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patients at less than or equal to their goal weight, percentage of patients on a beta-blocker, and percent of patients on an angiotensin converting enzyme inhibitor, and medication adherence rate.

Results: The clinic managed 70 patients with heart failure over the three-year period involving 613 clinic visits. Hospital admission rates for patients seen in the Heart Failure clinic decreased by 71% during the clinic's first three years compared with what these patients experienced prior to their referral. At baseline, 19% of patients were at their goal weight. Over time this improved to 56% of patients being at their goal weight. At baseline prior to referral to the clinic, 62% of patients were receiving an angiotensin converting enzyme inhibitor and 85% were on a beta-blocker. This improved for patients seen in the heart failure clinic to 74% for angiotensin converting enzyme inhibitor and 95.7 % for beta-blockers. Medication adherence increased from 51% to 88%. During this 3-year period, the Heart Failure Clinic achieved a net financial benefit of \$1.57 million dollars during this time. The financial largely derived from cost savings associated with reduced hospital admissions.

Conclusion: A comprehensive approach to optimizing medication usage and adherence in heart failure patients along with healthy lifestyles improved clinical outcomes and reduced exacerbations of this disease. Medication non-adherence is a frequent factor in treatment failure with heart failure. Medications are a cornerstone of therapy for heart failure. The best care plan often fails when patients struggle with carrying out medication aspects of therapy. A more comprehensive approach to medication management and adherence should be a top priority for health providers. Pharmacists working in collaboration with physicians and midlevel providers can achieve significant improvements in clinical outcomes for heart failure.

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Session-Board # - 7-003

Poster Title: Clinical and financial outcomes for a multidisciplinary transitions of care program and clinic

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Poorly coordinated care transitions from hospitals to other care settings or home cost an estimated \$12-44 billion per year. Poor transitions often result in negative outcomes related to errors, complications, treatment failures, and falls. In recent years, 30-day hospital readmission rates for chronic diseases have typically ranged from 20-30%. Readmission rates at this 97-bed hospital were 24.8% for heart failure, 20.3% for chronic obstructive pulmonary disease, 16.2% for pneumonia, and 15.5% for all causes between 2011-2014. In 2015, pharmacy developed a multidisciplinary transition of care program to implement strategies to reduce re-admission rates and improve clinical outcomes following hospital discharge.

Methods: A multidisciplinary transition of care program and clinic with a clinical pharmacist-nurse practitioner team was implemented in 2015 to optimize the transition of moderate-high complexity/risk patients from hospital to home. Opportunities for improvement included: 1) 70% of patients don't take medications properly- non-adherence is a major factor in treatment failures, readmissions, progression of chronic diseases, and adverse events, 2) prescriptions not filled in a timely manner post-discharge, 3) patients often fail to follow-up with primary and specialty providers, lab monitoring, and diagnostic testing after discharge, 4) inadequate care coordination is a major factor in treatment failures and readmissions. The transitions of care program involves: 1) pharmacist and nurse practitioner participation in multidisciplinary hospital rounds to identify patients at elevated risk for readmission; 2) the pharmacist and nurse practitioner meet with patients to identify needs, clinical financial risks, to initiate care coordination, and schedule post-discharge transitions clinic visit; 3) telephone follow-up at 48 hours; 4) transitions clinic visit (comprehensive medication

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review/reconciliation, patient education, financial assistance, clinical exam, follow-up tests, scheduling primary/specialty providers, and care coordination).

Results: Between April 2015 and September 2017 there were 803 patients completing the transitions of care program and clinic visits. During this time overall 30-day readmission rates for these patients was 4% for the same disease (compared with a range 20-25% (depending on the disease) during the 3-year period prior to establishing the transitions of care program. The all cause readmission rate over the 30-month period was 7% as compared to 15.5% during the 3- year baseline period. The transitions of care program and clinic achieved a \$1.7 million savings from decreased readmissions and avoidance of government imposed penalties. Clinic visits generated \$135,000 in revenue. The net financial benefit after salaries and other expense are factored-in was approximately \$1.5 million. Pharmacists initiated 2224 medication related interventions to correct issues with drug therapy (2.77 per patient, 2.31 per visit). Additionally there were 331 timely interventions to correct situations in which patients failed to initiate or were being medically untreated or undertreated.

Conclusion: A comprehensive multidisciplinary transitions of care program and clinic decreased 30-day hospital readmission rates to 4% (due to same disease) and 7% for all-cause readmissions resulting in improved clinical outcomes and reduced cost. A comprehensive approach to care coordination during care transitions is key to achieving optimal clinical and financial outcomes. Clinical pharmacists working in collaboration with patients and family, mid-levels, physicians, and case managers can achieve significant improvement in patient transitions to home. Based on results observed with this project, similar opportunities for improvement exist with other care transitions involving the emergency room, extended care facilities, and rehabilitation facilities.

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Session-Board # - 7-004

Poster Title: Characteristics of adults with a history of uncontrolled type 2 diabetes within a federally qualified health center

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: A primary care, federally qualified health center reports annual data based on Uniform Data System requirements for diabetics with A1c greater than nine percent. Despite efforts dedicated to improving A1c lowering, our annual data has stayed stagnant with about 30 percent of our diabetic population having an A1c greater than nine percent. This research aims to describe characteristics of patients from this organization with type 2 diabetes who have had an A1c in the last three months and who have also had at least one A1c greater than nine percent in the last year.

Methods: A retrospective chart review was performed of adults aged 19-75 years old with type 2 diabetes who were seen within the clinic and had an A1c value recorded within a three-month time period (August, September, and October 2017) and also had an A1c greater than nine percent within the preceding 12 months. Data was collected including basic demographic information with respect to race, sex, age, insurance status, and primary language, diabetes medication regimen including the number of oral antidiabetic medications, insulin, and non-insulin injectables, the number of encounters with providers, diabetic educators or clinical pharmacists during the study period, and change in weight over the study period. Comparisons between the two groups (A1c less than or equal to nine percent and A1c greater than nine percent) were conducted using t-tests and chi square analysis. Regression models were utilized to predict factors that influence whether a patient is more likely to reach A1c goal (less than or equal to 9 percent) or not. This was approved by the local institutional review board.

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Results: A total of 306 patients were reviewed who had an A1c within the three-month study period and 45 percent (n equals 140) of these patients had an A1c greater than nine percent (uncontrolled). There were no statistically significant differences in race, age, or sex between the two groups with the majority being white (85 percent) followed by African American (6 percent) (p equals 0.6652). Mean age was 51 years old. There were no differences in payer source between the groups: 65 percent were uninsured, 30 percent had federally funded insurance, and five percent were commercially insured (p equals 0.9026). Patients with an A1c less than or equal to nine percent (controlled) were more likely to have been diagnosed in the past year (28.9 percent) compared to those who were uncontrolled (p equal 0.0441). The starting A1c for patients achieving an A1c less than or equal to nine percent was significantly lower than those with an uncontrolled A1c (10.2 percent versus 11.1 percent). Statistically significant more patients with an uncontrolled A1c were more likely to be taking metformin compared to those with an A1c less than or equal to nine percent (82 percent versus 44 percent) (p less than 0.01).

Conclusion: There was not a significant difference among race, sex, or age among those who were controlled versus uncontrolled. Statistically significant more patients who were uncontrolled were taking metformin compared to those who were controlled. The biggest predictor of patients being uncontrolled was their baseline A1c and if they were diagnosed over a year ago.

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Session-Board # - 7-005

Poster Title: Evaluation of pharmacist intervention on closure of quality gaps in a merit based payment system within an accountable care organization (ACO)

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Congress implemented the Medicare Access and Children's Health Insurance Program Reauthorization Act (MACRA) which utilizes quality measurements to drive incentive payments. MACRA combines measures into one reimbursement program called the Merit-based Incentive Payment System. Accountable care organizations (ACO) aim to fulfill measurements to prevent unnecessary costs, but add to prescriber work load. ACOs achieve performance scores where prescribers may receive payment bonuses if benchmarks of performance standards are met. Centers for Medicare and Medicaid Services (CMS) acknowledged that pharmacists are integral members of teams and provide unique perspectives to fulfill these measures. Studies demonstrating outcomes from pharmacist intervention are limited.

Methods: A report of potential patient records with identified commercial quality measure gaps was retrieved. Patients with a scheduled visit with their prescriber in the first quarter of 2018 (January 1 to March 31, 2018) were included in this analysis. Patients without a scheduled appointment in the first quarter of 2018 were excluded. Potential gaps in care were communicated and intervened by pharmacist to prescriber via the prescribers' preferred method of communication. Prescribers in practice one were intervened by in-person recommendation only, as per prescriber request. Prescribers in practice two were intervened by a combination of chart alert, electronic message, and in-person recommendation. Pharmacist intervention occurred between one and seven days prior to the patient's scheduled visit, depending on prescriber availability. One week after the visit, the pharmacist performed a

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retrospective chart review to assess whether or not the quality measure gap was assessed and closed properly by the prescriber. The primary outcome was the percent of commercial quality measure gaps successfully closed by any type of pharmacist intervention. We also aim to determine whether or not method of communication affects closure of these measures.

Results: A total of 59 patients met the inclusion criteria and had at least one potential gap in care, yielding a total of 75 gaps in care. A total of 38 and 37 gaps were open in practices one and two, respectively. All potential quality gaps included: 1) incomplete depression screen in patients aged 18 years and older (47%); 2) incomplete colorectal cancer screening in patients aged 50-75 years (28%); 3) hemoglobin A1c greater than eight percent in patients aged 18-75 years with diabetes (11%); 4) blood pressure reading greater than 140/90 mmHg in patients aged 18-85 years (7%); 5) incomplete mammogram in women aged 50-74 years (5%); 6) incomplete eye exam in patients aged 18-75 years with diabetes (2%). Overall, 40% of total quality measure gaps were closed after pharmacist intervention. A total of 100% of mammograms, 63% of hemoglobin A1c, 60% of blood pressure, 40% of depression screenings, 19% of colonoscopies, and 0% of eye exams were completed or brought to goal. There was no difference in quality measure gaps filled between practices.

Conclusion: Pharmacist expertise of chronic disease state management provides value to closure of quality measurements which drive incentive payments. Addition of a pharmacist to outpatient office practices may assist practices in receiving payment bonuses by increasing percent of benchmarks met. More research is needed to assess the cost avoidance and effect on reimbursement after addition of pharmacy services.

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Session-Board # - 7-006

Poster Title: Pharmacists role in pain management of pediatric patients after tonsillectomy after discharge

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Evaluate the role of the pharmacist after discharge for the monitoring and education of opioid prescribing.

Methods: This descriptive study of WVU Medicine's pain management strategies following outpatient pediatric Tonsillectomy with or without Adenoidectomy aims to understand the patients' attested use and resulting unintentional overprescribing of opioid medications. The primary goal is to determine which pain medications are being prescribed, including dosage and amount, with an overall endpoint of trying to reduce excessive dispensing of narcotics through the use of the American Academy of Pediatrics PDSA Cycle. Tonsillectomies and Adenoidectomies are one of the most commonly performed surgeries for pediatrics in the United States each year. (1) The outpatient surgery is associated with moderate-severe postoperative levels of pain, controlled by a combination of opioids, acetaminophen and ibuprofen. As no consensual pain management regime exists, especially in relation to duration, it is important to follow up with patients/caregivers to understand the individual use of opioids throughout their pain management. Detecting a recurring correlation of patients not requiring opioid pain control for the duration prescribed, can decrease the amount of opioids dispensed for over a half million children under fifteen years old nationwide.(1)

Results: Chart studies were utilized to determine which medications were prescribed as well as patient complications. Telephone survey was conducted by Pharmacists and Pharmacy Interns two weeks after surgery to assess trends such as medication counseling, overall pain

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satisfaction, amount of medication leftover, complications of medication use, and need for medication refills.

Conclusion: Patients, on average, received 42 doses of Loratab ranging from a two day supply to thirty days. Forty percent of patients had a remainder of greater than half the prescribed amount of Lortab, while pain satisfactory scores averaged 4.5/5. This equates to an excess of over 12,000 ml of Lortab prescribed to patient. First quarter of study immediately led to departmental changes to a maximum day supply for patients of seven days. Action Plans such as Medication Regimen Standardization as well as a discharge pharmacists' education and handout, emphasizing the use of acetaminophen and ibuprofen over Lortab, have been utilized.

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Session-Board # - 7-007

Poster Title: Associated unilateral facial swelling and skin rash in a patient on warfarin

Poster Type: Case Report

Submission Category: Ambulatory Care

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Purpose: Allergic cutaneous reactions in patients on warfarin are rare and reported at an incidence of less than 0.1 percent in the literature. Nevertheless, various types of warfarin-induced cutaneous reactions have been reported including vesicular, maculopapular, and urticarial lesions. Warfarin induced skin necrosis is a more serious dermatologic condition that occurs in an estimated 1 in 10,000 patients exposed to warfarin. Red, painful plaques have been reported within 5 days of taking warfarin and may progress to hemorrhagic blisters, ulcers, and ultimately lead to skin necrosis. Practitioners should distinguish these more serious cutaneous reactions from less serious skin eruptions. Cutaneous reactions to oral formulations of warfarin may be due to the active ingredient itself, or certain excipients such as dye. Albeit, precise causes of these adverse reactions remain unclear.

A 76-year old Caucasian female was initiated on warfarin 5 mg daily with a goal INR between 2 and 3 after a recent diagnosis of paroxysmal atrial fibrillation. Her past medical history included hyperlipidemia, hypertension, osteopenia, and allergic rhinitis. Other medications included fluticasone nasal spray daily, atorvastatin 10 mg daily, metoprolol succinate 12.5mg daily, estradiol 0.5mg daily, calcium carbonate 500mg twice daily, and biotin 200mcg daily. The patient has no known drug, food, or dye allergies. One week after starting warfarin, the patient presented to her primary care physician with a headache, facial rash, and fluid accumulation below the left eye. Physical exam revealed significant left-sided facial erythema, tenderness, and warmth in the V1 and V2 trigeminal nerve distribution. A computerized tomography scan was performed and deemed unremarkable. Abnormal laboratory findings included an elevated C-reactive protein of 28mg/L, and an elevated white blood cell count of 15,000/ μ L. The

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patient's INR was 2.2 and warfarin was noted as the only recent change to the patient's medication regimen. The primary care physician discontinued the warfarin and prescribed a 6-day methylprednisolone-tapering regimen, cetirizine 10mg every morning, and diphenhydramine 25mg every evening for the next week. One week later, the facial swelling and rash subsided. The patient continued to report intermittent erythema and pruritus, but with improvement. The INR fell below 2 and apixiban 5 mg twice daily was initiated. Two weeks following warfarin discontinuation, the patient returned to the clinic for follow-up. Her symptoms were fully resolved. Naranjo algorithm produced a score of 5 indicating the rash was "probably" induced by warfarin. This case report further supports the association between warfarin and allergic dermatologic reactions. Although rare, it is important for providers to be aware of this potential adverse effect. Further studies are necessary to fully ascertain how, and why these adverse reactions occur.

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Session-Board # - 7-008

Poster Title: Role of pharmacists in reducing heart failure readmissions in the community setting

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Congestive heart failure (CHF) costs the nation 30.7 billion dollars each year. In 2017, San Joaquin General Hospital (SJGH) felt that there was a significant increase in the number of patients being readmitted for CHF. In response, SJGH moved the CHF clinic into the primary care clinic and changed the format into a multidisciplinary team based clinic. The purpose of this study was to assess the impact of the new clinic format on heart failure readmission rates between patients seen in the new clinic and those who were not. The specific impact of pharmacist interventions was also assessed.

Methods: This was a single-center observational study with retrospective and prospective phases. The retrospective phase of this study consisted of a review of all admissions related to CHF between July 1, 2016 and June 30, 2017. CHF admissions were identified by searching CHF-related ICD-10 codes within the admissions database. This served to establish a baseline for CHF-related admissions. During the prospective phase (July 1, 2017 to February 28, 2018) the readmission rates were compared between patients who attended the CHF clinic versus those who did not. All patients who were 18 years of age or older, overseen by a primary care provider within the SJGH system, and diagnosed with heart failure were included in the study. Patients were excluded if they were less than 18 years of age or were in the custody of the California Department of Corrections and Rehabilitation (CDCR). The primary endpoint of this study was the difference in 30-day readmissions between patients who attended the CHF clinic versus those who did not. Secondary endpoints included the number of admissions before and after a patient's first clinic visit, the number and type of interventions performed by pharmacists in the CHF clinic, and the length of hospital stay (LOS) for exacerbations.

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Results: A total of 218 CHF-related admissions were identified during the retrospective review period. Twenty of these admissions were 30-day readmissions. The 218 admissions accounted for 908 hospital days with an average LOS of 4.2 days. During the prospective phase there were a total of 127 admissions, which were attributable to 102 patients. Eighty patients had never been seen in the clinic and 22 patients had at least one clinic visit. Patients not seen in clinic accounted for 91 total admissions, three 30-day readmissions, 479 hospital days, and an average LOS of 5.7 days. Patients who had at least one clinic visit accounted for 36 admissions, two 30-day readmissions, 24 hospital days, and an average LOS of 3.4 days. The difference in 30-day readmissions was not significantly different between groups ($P=0.160$). In the group of patients who had at least one clinic visit there was a significant decrease in the number of admissions after a patient's first clinic visit (29 versus 7, $P=0.002$). Of the 329 interventions made during the prospective phase 157 involved a CHF medication. By the end of the study period, 50 percent of the patients had an improvement in their New York Heart Association (NYHA) functional class.

Conclusion: Pharmacists working in a multidisciplinary CHF clinic play an important role in improving patient outcomes. While there was no significant difference in 30-day readmissions, patients who attended the clinic showed a significant decrease in CHF-related admissions after their first clinic visit. Patients seen in the clinic also had a shorter LOS and an improvement in their NYHA functional class.

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Session-Board # - 7-009

Poster Title: Hepatitis C virus treatment with elbasvir/grazoprevir in a diverse patient population at an urban academic medical center

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: The direct-acting antiviral combination of elbasvir/grazoprevir offers high sustained virologic response (SVR) rates for hepatitis C virus (HCV) treatment. From 2016 to mid-2017, elbasvir/grazoprevir had the lowest advertised wholesale acquisition cost of the available HCV DAA regimens. Several payers adjusted formulary coverage to mandate use of elbasvir/grazoprevir over other DAA regimens, yet extensive real-world data on SVR rates with elbasvir/grazoprevir treatment is lacking. The purpose of this study is to evaluate the SVR rates of elbasvir/grazoprevir treatment at a diverse urban academic medical center.

Methods: This retrospective cohort study was approved by the institutional review board. Investigators reviewed the electronic medical records of patients who started HCV treatment with elbasvir/grazoprevir from January 28, 2016 to December 1, 2017 at an urban academic medical center. The investigators collected baseline characteristics including age, gender, ethnicity, body mass index (BMI), concurrent medications, and comorbidities; and HCV-specific information including stage of liver disease, previous HCV treatment history, current HCV regimen; and lab results. Data on documented medication adherence and adverse events were also collected. The data were analyzed using descriptive statistics, Fisher's exact test, and Pearson's chi-square test. The primary endpoint was the percent of patients who achieved SVR. Secondary endpoints included evaluation of SVR rates by baseline patient characteristics.

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Results: Sixty-four patients started HCV treatment with elbasvir/grazoprevir. Ninety-one percent received elbasvir/grazoprevir and 9 percent also received ribavirin. The patient population was 58 percent male, 80 percent African American, had a mean age of 62.3 years (standard deviation equal to 8.3), and a baseline BMI of 30 (standard deviation equal to 8.4). In the population, 56 percent had genotype 1a, 91 percent were treatment-naïve, 34 percent were on dialysis, 48 percent had Medicaid insurance, 38 percent were cirrhotic, 17 percent were post-transplant, 38 percent had diabetes, 23 percent had psychiatric illness, and 3 percent had hepatocellular carcinoma (HCC). Fifty-three percent had drug-drug interactions at baseline. Adherence data showed that 23 percent of patients reported 1 or more missed dose(s) during treatment. Adverse events included a 10-percent rate of fatigue and 3-percent rate of headaches during treatment. No patients discontinued treatment. The overall SVR rate was 94 percent. After excluding the 3 patients who were lost-to-follow-up, the SVR rate was 98 percent per protocol. SVR rates did not differ by stage, cirrhosis, gender, age, obesity, genotype, treatment history, insurance, comorbidities, adherence, or drug-drug interactions, (p value greater than 0.05). One Caucasian patient, the only patient with HCC, did not achieve SVR.

Conclusion: Treatment with the low-cost DAA regimen of elbasvir/grazoprevir achieved a high SVR rate in this diverse patient population which included off-label treatment of post-transplant patients and a high proportion of cirrhotic patients. The SVR rates did not differ by demographics, yet conclusions across groups are limited due to the small numbers. This regimen offers a successful treatment option for HCV patients and was used widely by Medicaid insurance prior to the availability of a new lower-cost pangenotypic regimen.

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Session-Board # - 7-010

Poster Title: Implementation of pharmacy services in a home health program

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Medication errors have the potential to cause significant harm to patients. Incorporating a pharmacist in the medication reconciliation process during transitions of care has been shown to decrease the number of potentially dangerous errors. Currently, pharmacy is not involved in the home health program at our institution. The objective of this study is to determine the impact of pharmacy on medication reconciliation in this setting.

Methods: This study was granted expedited IRB approval. Pharmacy services will be consulted by home health staff for patients determined by nurse or physician to be at high risk of medication errors. Initial phase of patient data collection consists of patients seen in conjunction with home health nurses. Secondary phase will include patients contacted by pharmacists to perform a medication reconciliation and update medication list. Patients deemed to be particularly high risk of medication errors will be eligible for a home visit by a pharmacist. Data will be collected prospectively regarding medication discrepancies between documented medication list and what patient is actually taking and interventions performed by pharmacy personnel.

Results: Initial phase of data collection included 9 patients seen by pharmacy services in conjunction with nurse home visits. Four of these were new admissions, 2 were routine visits, and 3 were final visits in which the patient was discharged from the home health program. Patients had an average of 14 medications listed and 6.1 medical problems. There were 23 medication discrepancies noted. The most common type of discrepancy was medication

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missing from list (n=12) followed by wrong directions (n=5), wrong dose (n=4), and patient no longer taking medication on list (n=2). There were 35 pharmacy interventions performed, which included clarifying the aforementioned discrepancies in addition to medication counseling (n=7) and drug information question responses (n=5).

Conclusion: The majority of the discrepancies noted were those associated with patients taking medications not noted on documented lists. These were typically over-the-counter drugs. The clinical significance of these discrepancies is unclear, however, the incidences of patients taking the wrong dose or using wrong directions certainly have the potential to cause harm. Continued pharmacist involvement in the home health setting may be beneficial in identifying and resolving these medication errors.

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Session-Board # - 7-011

Poster Title: Clinical response to generic fluticasone propionate/salmeterol multidose, dry-powder inhaler in asthma patients managed at an ambulatory care practice setting

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: A generic inhaled corticosteroid/long-acting beta agonist (ICS/LABA) combination inhaler, fluticasone propionate/salmeterol, has recently been approved. The multidose, dry powder inhaler (MDPI) is the first generically available ICS/LABA combination inhaler. At Atrius Health, a multi-site ambulatory care organization, the clinical pharmacy team has instituted a cost-savings initiative for patients with asthma currently controlled using brand-name ICS/LABA combination inhalers. The initiative includes switching clinically applicable patients from their current inhaler to comparable doses of the generic inhaler. Currently, there is little data on patients' clinical response to generic fluticasone propionate/salmeterol MDPI when switched from one of its competitors.

Methods: The Institutional Review Board at MCPHS University has approved this study. Patients 12 years of age or older who were switched from a brand-name ICS/LABA inhaler to the generic inhaler were included in the study. Their asthma control on the generic inhaler was assessed via prospective chart review. Patients were excluded if they had a diagnosis of COPD with no diagnosis of asthma. The primary endpoint was worsened asthma control requiring change in therapy, increased dose of ICS/LABA, oral corticosteroid therapy, or hospitalization at or before 12 weeks. Secondary endpoints included extending the primary outcome to 24 weeks, comparative switch rates at sites with and without a clinical pharmacist, and annual cost-savings.

Results: In total, 413 patient charts have been reviewed for inclusion into the study with 219 patients meeting inclusion criteria. 61.2% of patients were female and the average age was

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49.9 years. An additional 16 patients were excluded from the primary endpoint as they were switched back to their previous inhaler for reasons other than worsened asthma control. Of 203 patients, 35 had a change in therapy due to worsened asthma control (17.2% of patients – 95% CI 12.0% to 22.4%) within 12 weeks. Of 25 patients followed for 36 weeks, 8 had a change in therapy due to worsened asthma control (32.0%). Total projected yearly savings for switching the 186 patients who were not switched back to their previous inhaler was \$581,628. Of 32 total sites at Atrius Health, 13 have a clinical pharmacist on-site. 171 of the 219 total switches that were made occurred at sites with a clinical pharmacist (78.1%).

Conclusion: Roughly 83% of patients who were switched from brand-name ICS/LABA inhalers to generic fluticasone propionate/salmeterol MDPI maintained appropriate asthma control for 12 weeks. Significant cost-savings are associated with making this switch for both patients and healthcare systems. Clinical pharmacists were associated with higher rates of patients switched and more cost-savings. More data is needed to show the long-term effects of switching to generic fluticasone propionate/salmeterol.

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Session-Board # - 7-012

Poster Title: Implementation of pharmacy services in an outpatient heart failure clinic

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Heart failure is a chronic, progressive condition in which the heart is unable to maintain adequate blood circulation needed to sustain physiological function. Approximately 5.7 million adults in the United States have heart failure and an estimated one half of the patients will die within 5 years of initial diagnosis. Heart failure places a heavy financial burden on the national economy with an annualized cost estimated to be \$30.7 billion. This condition can be effectively managed through medication therapies and lifestyle modifications. A multidisciplinary approach to managing this patient population has been shown to provide improvements in clinical outcomes.

Methods: From August to December 2017, biweekly meetings with multidisciplinary group including pharmacy staff, physicians, nurse practitioners, and other healthcare professionals, were held to establish the goals and workflow of the outpatient heart failure clinic. Pharmacy's role within the clinic included medication reconciliation, recommendations for guideline-directed medication therapy, assessing barriers to care, and patient education. Through these pharmacy interventions we expected to impact the hospitalization and readmission rates for these patients. In January 2018, the outpatient heart failure clinic started seeing patients. To support the pharmacy component of the clinic, the inpatient transitions of care (TOC) pharmacist responsibilities and expectations were amended to include outpatient responsibilities at the outpatient heart failure clinic. The expectations included reviewing the patient's chart, interviewing the patients, making recommendations to the provider, and providing any additional education prior to the patient leaving the appointment. Documentation of pharmacist's interventions and recommendations were to be detailed on the updated clinic document as well as in the MedKeeper Hub database.

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Results: Data was collected from January 3, 2017 to March 30, 2017 with a total of 96 patients evaluated.

A total of 52 interventions accepted by providers were documented with the most common interventions including titration of medications, initiation of medications and hold/stop medications.

The baseline heart failure 30-day readmission rate for Baptist Health Care is 25.69%. The 30-day heart failure readmission rate for patients who were seen in the clinic during the study period was 14.58% (14/96). The mean per-patient cost of a heart failure related hospitalization is estimated to be \$14,631 according to a recent publication. Based on an estimated 10 avoided heart failure readmissions during the study period, there was an estimated cost avoidance of \$146,310 with an extrapolated annual cost avoidance of \$585,240.

The outpatient heart failure clinic has now expanded from two days per week to five days per week with further expansion of the inpatient transitions of care program to continue to provide services to the clinic.

Conclusion: Overall, the implementation of pharmacy services in an outpatient heart failure clinic was shown to be effective, providing continuity of care and decreased hospital readmission rates to below national and organizational rates with substantial cost avoidance appreciated during the study period. Provider feedback validated the important contributions the pharmacy services added to the heart failure clinic with improved provider-pharmacy relationships. Billing codes are being validated with the hopes of billing for pharmacy services in the near future.

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Session-Board # - 7-013

Poster Title: Best practices for safe use of SGLT-2 inhibitors developed from an expert panel Delphi consensus process

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Sodium-glucose co-transporter 2 (SGLT-2) inhibitors have demonstrated efficacy in patients with type 2 diabetes mellitus (T2DM) in terms of A1c reduction and reduction in cardiovascular outcomes in patients with atherosclerotic cardiovascular disease. However, they are also associated with serious adverse effects. Given the increased use of SGLT-2 inhibitors, clinicians need to respond to the emerging safety data, but little guidance exists on how to operationalize the recommendations. This study aimed to develop a list of best practices for the safe use and monitoring of SGLT-2 inhibitors in patients with T2DM through use of the Delphi technique.

Methods: The institutional review board at the University of Maryland, Baltimore approved this survey-based study. A panel of healthcare professionals (nurses, pharmacists, and physicians) from across the United States familiar with the care for patients with T2DM and the use of SGLT-2 inhibitors were selected for a four-round Delphi process. In round 1, panelists were asked to freely comment on monitoring parameters, actions, or considerations for appropriate initial prescribing and for minimizing and managing specific adverse events. The adverse events included hyperkalemia, acute kidney injury, diabetic ketoacidosis, fractures due to decreased bone mineral density, leg and foot amputations, hypotension, urinary tract infections, genital infections, and a broad category for other adverse events. In round 2, panelists indicated their agreement with the statements formulated from round 1. Statements with a strong consensus, in addition to modified statements from round 2, proceeded to round 3, in which panelists rated the importance of the statements in reducing the adverse event rate in patients prescribed SGLT-2 inhibitors. In round 4, panelists selected if the statements should be

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considered a best practice specific to SGLT-2 inhibitors, a best practice for general safe medication use, or if the statement should not be considered as a best practice for safe medication use.

Results: A 15-member interprofessional panel with an average of 17.9 years of diabetes-related practice participated in the Delphi consensus process. In round 1, panelists submitted 440 statements describing safe use of SGLT-2 inhibitors. These statements represented 351 unique concepts that were grouped by the investigators into 150 questions related to the different concept areas. Round 3 included 217 individual concepts from round 2, and 148 of these concepts were deemed by the panel to be critical to or likely to reduce adverse event rates for patients prescribed a SGLT-2 inhibitor. In round 4, panelists came to a consensus on 37 best practice statements specific to SGLT-2 inhibitors and 25 statements as general best practices for safe medication use. Fifty-four percent of the best practice statements for SGLT-2 inhibitors pertained to managing and/or preventing hypotension, urinary tract infections, and genital infections. There were no best practice statements specific to SGLT-2 inhibitors for the prevention or management of leg and foot amputations. The general best practices for safe medication use primarily focused on medication histories, past medical history considerations, physical exam components, and patient education.

Conclusion: A list of best practice statements was developed using the Delphi method, which can be utilized by clinicians to guide the safe use and monitoring of SGLT-2 inhibitors in patients with T2DM.

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Session-Board # - 7-014

Poster Title: Prescribing patterns of patients with type 2 diabetes from a federally qualified health center

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: A primary care, federally qualified health center serves a diverse patient population with almost half of the patients being uninsured. Despite efforts dedicated to improving A1c lowering in this population the percentage of patients who are uncontrolled has remained stagnant. This research highlights prescribing patterns for patients with type 2 diabetes who have had an A1c in the past three months, who have also been uncontrolled within the past year, in an effort to identify trends that may describe why a patient reaches an A1c less than or equal to nine percent or an A1c greater than nine percent.

Methods: The institutional review board approved this retrospective cohort study. Medical records of adult patients (ages 19-75 years of age) seen at the primary care, federally qualified health center with type 2 diabetes who have had an A1c within a three-month time period (August, September, October 2017) and who have previously had an A1c greater than nine percent within one year of the reporting date were reviewed. Chart review consisted of obtaining pertinent patient information including demographic information, lab values to indicate level of diabetes control, medication regimen, interactions with providers in clinic, and weight changes. Prescribing patterns for patients who were controlled (A1c less than or equal to nine percent) and uncontrolled (A1c greater than nine percent) were compared using chi square and t-tests.

Results: Of the 327 patient medical records that were reviewed, 306 patients met the inclusion criteria. Patients with an A1c less than or equal to nine percent used slightly fewer medications on average (2.17) compared to those with an A1c above nine percent (2.32) but the difference

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was not statistically significant (p equals 0.16). In particular, patients with an uncontrolled A1c were significantly more likely (p less than 0.01) to be taking metformin (82 percent versus 44 percent), basal insulin (60 percent versus 22 percent) and bolus insulin (34 percent versus 12 percent). Very few patients in this sample were prescribed a GLP-1 agonist and, as such, it did not differ significantly between those with an A1c above nine percent and those below (eight percent versus six percent, p equals 0.65).

Conclusion: In a federally qualified health center population of type 2 diabetes patients with an uncontrolled A1c in the past year, medication prescribing patterns do not appear to positively correlate with patient attainment of goal A1c (less than or equal to nine percent). While patients struggling to attain A1c goal seem to be appropriately prescribed additional diabetes medications, these interventions alone do not seem to be adequate for getting some patients to goal. Additional research is needed to better understand factors leading to treatment success.

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Session-Board # - 7-015

Poster Title: Assessing the landscape of clinical pharmacy services in federally qualified health centers

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: The effectiveness of pharmacist interventions on patient care outcomes is well documented, but has yet to be evaluated in Federally Qualified Health Centers (FQHCs). This project aims to serve as evidence that the ASHP Foundation's vision that "patient outcomes improve because of the leadership and clinical skills of pharmacists" is a reality for FQHCs in the United States. The purpose of this project is to determine how pharmacists are currently engaged with FQHCs to provide care for underserved patient populations across the country, specifically assessing clinical pharmacy services offered to patients of FQHCs between 2013 and 2016.

Methods: This IRB exempt, cross-sectional study recruited representatives from FQHCs and pharmacists practicing in FQHCs to participate in an online survey (Qualtrics™) via email invitation sent to the Midwest Clinicians Network and through the American Society of Health-Systems Pharmacists' Connect platform. The voluntary, 32-item survey gathered data through multiple choice, fill-in, and open-ended questions on clinical pharmacist coverage over the four years being studied, types of clinical pharmacy services (CPS) offered, medication access models, pharmacist access to the electronic health record, funding for pharmacist positions, reimbursement models for pharmacist services, use of collaborative practice agreements, if outcomes were tracked for pharmacist services, successes and challenges in starting services, and future plans for pharmacy services. The survey was open from October 2017 to February 2018. Summary statistics were reported by study group for continuous data as means and

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standard deviations if normally distributed or as medians and inter-quartile ranges otherwise. Categorical data was reported by study group as counts and frequencies (%).

Results: Seventy two participants from 21 states responded to the survey. 75% of respondents (46/61) indicated CPS are currently provided for their patients, and 45.8% of respondents (33/72) reported that they are anticipating the development of additional CPS within the next year. Commonly reported CPS were chronic disease management for diabetes (71.7%), hypertension (65.2%), anticoagulation (56.5%), hyperlipidemia (56.5%) and comprehensive medication reviews (69.6%). Challenges that were identified with regard to implementing new CPS were: funding (30), personnel/staffing (27), and lack of resources (26). In terms of medication access, 61.1% of respondents (44/72) reported 340b pharmacy contracts. The percentage of sites indicating pharmacists have electronic health record access varied according to whether they were on-site, dispensing, or providing CPS and ranged from 2.8% to 41.7%. Of the 46 respondents that offer CPS, 17 indicated a pharmacist position funded by the site, 10 reported funding by a college of pharmacy, 6 reported a position co-funded by both, and 10 declined to respond. The most common reimbursement models were 340b revenue and cash/self-pay. 76% of participants (26/34) reported tracking outcomes for CPS services. 44.4% of respondents (32/72) noted use of collaborative practice agreements. 23 respondents indicated interest in future research collaborations.

Conclusion: This study demonstrates the current engagement of pharmacists in FQHCs and patient access to clinical pharmacy services in community health centers. Results could serve as a reference for health centers looking to expand their service-offerings to include medication management provided by pharmacists. Results also provide the foundation for the development of practice-based research networks that examine the impact of pharmacist interventions in FQHCs. Another future direction of this study is the comparison of Uniform Data System (UDS) outcomes between FQHCs that offer CPS to those FQHCs that do not to assess the impact of pharmacists on these measures.

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Session-Board # - 7-016

Poster Title: Improving diabetes self-management via pharmacist run diabetes education group classes

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Pharmacists play a crucial role in diabetes education and management. Individual pharmacy diabetes visits at a primary care clinic consistently identified patients with poor insight in diabetes self-management skills. Group diabetes education classes allow practitioners to capture and educate more patients simultaneously and provide them with an additional system of support. Group diabetes classes improve glycemic control, patient attitudes, and increase self-empowerment. This service was created to provide an additional avenue of support in improving diabetes self-management skills for patients belonging to a primary care practice.

Methods: A pharmacy team specializing in diabetes education in a primary care clinic designed a diabetes education series consisting of 5, 2-hour classes, meeting every other week. Each class focused on different aspects of diabetes self-management: Introduction to diabetes; Nutrition, exercise and sleep; Treatment; Complications; and Health maintenance for diabetes. Every class included a “Doc-Talk” where a healthcare provider from the practice was invited to speak on a related topic, and a 30-minute exercise session led by a professional health and fitness coach. At the end of every class, patients were provided with free giveaways that related to the topics being covered in the respective classes. Giveaways were donated by vendors and/or funded by a research grant from Shenandoah University. Items included pillboxes, slippers, toothbrushes, diabetes supply organizers, pedometers, exercise resistance bands, blood glucose meters, plate-method plates, and lunch boxes. Patients were recruited via

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provider and pharmacy diabetes clinic referrals. Additionally, patients who were newly diagnosed or had chronic poorly controlled diabetes with a hemoglobin A1c level of greater than eight percent were contacted and invited to enroll.

Results: Two pharmacy diabetes education classes were run every other week, each consisting of 5 total classes. A total of fifteen patients enrolled in the program; two patients did not attend past the first class. One patient withdrew from the program due to lack of perceived benefit, and one patient withdrew due to cost. One patient missed one class session due to travel, and one other patient missed two classes due to lack of transportation. Throughout the program, patients were asked refresher questions relating to previously taught skill-sets such as treatment of hypoglycemia and/or glycemic goals and were able to correctly recall the answers. As part of the refresher questions, patients were also able to identify multiple strategies to lower the glycemic index of various meals. Overall, patient perceptions of the program were extremely positive. They appreciated the pharmacist-led format of the sessions and positively responded to the “Doc-Talk” and exercise components of the classes. Patients liked the group format and indicated that they would have liked for the program to last longer because they appreciated receiving the information and support for improving their diabetes management.

Conclusion: A pharmacist led diabetes education group class program is an excellent means to providing diabetes self-management skills to patients with poor diabetes insight. This program provides a comprehensive approach to teaching self-management skills and creates a supportive environment for asking questions and exploring ways to improve patients’ blood glucose levels in a sustainable way. As a result of patient feedback, the pharmacy team will develop and implement an additional support group class that will meet quarterly for patients who complete this program and would be interested in continuing to receive support in a group setting.

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Session-Board # - 7-017

Poster Title: Association between anticoagulation clinic visit compliance and therapeutic international normalized ratio (INR) result

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: Previous internal assessments of a pharmacist-run anticoagulation clinic have revealed that patients receiving warfarin had INRs that were therapeutic 57-63% of the time. Non-adherence with warfarin therapy was found to be the most common reason for non-therapeutic INR results. In an attempt to improve therapy adherence several modalities were employed: increased pillbox usage and counseling time. Despite these changes, improvements were not seen in therapeutic INR results. It was determined that other modifiable reasons for subtherapeutic INRs needed to be investigated. The current assessment was undertaken to determine if non-adherence to anticoagulation clinic appointments would correlate with non-therapeutic INR values.

Methods: As part of an institution supported, continuous quality assurance program, a review of patients receiving warfarin managed by the anticoagulation clinic in 2017 was conducted. Patients were grouped in accordance with their attendance at anticoagulation clinic visits; compliant (<4 missed appointments/year) or non-compliant (≥ 4 missed appointments/year). The primary outcome was the total number of therapeutic INRs.

Results: A total of 90 patients were managed by the anticoagulation clinic in 2017 and included in the analysis. Forty-five were categorized as compliant and 45 were non-compliant with anticoagulation clinic visits. There were a total of 1031 INR results from 2017 across both patient groups. There were 309 (56 percent) therapeutic INR results in the compliant group compared to 194 (40 percent) in the non-compliant group, p less than 0.0001. Baseline demographics were similar between groups with the exception of age. Patients in the compliant group were older with a mean [Standard Deviation(SD)] age in years of 68 (14)

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compared to 56 (11), p less than 0.0001, however there was no difference in mean (SD) length of warfarin therapy between compliant and non-compliant patients, 7.5 (5.3) versus 7.5 (5.6), p equals 0.9538.

Conclusion: Non-adherence to clinic appointments may reveal a larger problem with adherence to other aspects of care. Additional interventions may be required to improve anticoagulation clinic attendance.

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Session-Board # - 7-018

Poster Title: Reducing infusion wait time for patients with infusion only appointments: a pilot to premix continuing oncology medications.

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: There is a considerable amount of delay between patients arriving to infusion for their appointment and to when their medications are available. During peak hours of infusion, the clean room operates at above the maximum capacity resulting in backlog in drug preparation. To shift some drug preparations to off-peak hours a premix pilot involving patients with infusion only appointments was conducted at Dana-Farber Cancer Institute (DFCI). Medications were prepared earlier in the day and prior to a patient's infusion appointment with the goal of decreasing overall medication turnaround time.

Methods: A Premix Working Group was formed which consisted of pharmacy leads, nurse leads and analytics and process improvement leads. The implementation of a new computer system that work off of daily infusion encounters only allows medications to be dispensed on the same day of the patient infusion appointment. One of the six infusion floors participated in the pilot starting in January 2018 looking at preparing specific continuing order medications ahead of scheduled infusion only appointments. Continuing orders include medications for subsequent days after the first initial treatment day. These medications can be prepared ahead of time before the patient's infusion appointment since they only depend on clinical information from day one of that cycle. Pharmacists along with infusion nurses identified patients on continuing orders utilizing a continuing order log sheet. Pharmacists validated the list and verified the orders before premixing and prior to patients arriving for their infusion appointment. The pharmacist also indicated on the patient label their infusion appointment time so they can be

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prepared in order and prior to the patient's infusion appointment. Continuing order data were extracted from the patient's electronic health record. The percentages of continuing orders prepared before the infusion appointment time were compared between baseline (September-December 2017) and implementation of the premix pilot (January-April 2018).

Results: The percentage of monthly continuing orders prepared before 8am increased from baseline months of September-December 2017 to pilot months of January-April 2018. At baseline, the percentages were 18% (September), 46% (October), 27% (November), and 30% (December). During the pilot months, the percentages were 44% (January), 77% (February), 63% (March), and 60% (April). In addition, the percentage of continuing orders that were prepared before infusion appointment time was increased from baseline to pilot months. At baseline, the percentages were 38% (September), 54% (October), 37% (November), 40% (December). During pilot months, the percentages were 67% (January), 83% (February), 65% (March), and 69% (April). Compared to baseline, the premix pilot shifted more continuing orders to be prepared earlier in the day and a higher percentage of orders prepared before the patient's infusion appointment time. As a result, the medications were readily available to be administered to the patient once the nurse completed their patient assessments and clinical checks.

Conclusion: The pilot was successful in shifting continuing medication order preparation to earlier in the day with a higher percentage of medications ready before the patient's scheduled infusion appointment time. There was an increase in efficiency in the cleanroom to prepare medications for same day appointments during peak hours thereby, decreasing the overall medication turnaround time. By decreasing the overall medication turnaround time, the patients overall experience improved during their visit to the infusion clinic on day of treatment.

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Session-Board # - 7-019

Poster Title: Counseling referrals and abstinence for veterans enrolled in smoking cessation (CRAVES)

Poster Type: Evaluative Study

Submission Category: Ambulatory Care

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Purpose: The use of tobacco among Veterans is one of the hardest habits to break. At VA Long Beach Healthcare System, pharmacists are tobacco cessation providers who manage patients in the different tobacco cessation clinic settings. Evaluations of these clinics provide insights that help with improving quit rates. We aimed to assess the quit rates in the group clinics following two changes 1/in the clinic structure and 2/ different psychologists supporting the clinic. We also compared the quit rates between the different individual-patient clinics. Lastly, we examined hospitalizations and mortality in Veterans who achieved abstinence versus those who continued using tobacco.

Methods: This is an Institutional Review Board approved, retrospective chart review study. The study period was December 1, 2013 to May 31, 2014 and December 1, 2016 to May 31, 2017 for the group clinics. Index date defined as the date the pharmacist first counseled the patient. Referred patients to group tobacco cessation programs between 2013 – 2014 (Group 1) and between 2016 – 2017 (Group 2); and the individual clinics: tobacco cessation individual clinic (TCI) and Patient Aligned Care Team (PACT) were included. Patients were excluded if there were no intervention(s) made by the tobacco cessation clinic pharmacist providers, missing of baseline characteristics, or no show to clinic appointment. Collected data included: baseline demographic characteristics (age, gender, race, body mass index, comorbidities), baseline tobacco-use characteristics (number of cigarettes per day, number of years of tobacco use, number of previous quit attempts, reason for relapse), pharmacotherapies (different forms of nicotine replacement therapy, bupropion, varenicline), and 6-month post index date quit rates, hospitalization and mortality. Abstinence (or quit) was identified by electronic medical record

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notes explicitly stating that patient had been abstinent at 6-month post index date. Missing this designation was considered did not quit. Descriptive statistics, chi-squared, and t tests were utilized when appropriate.

Results: 213 out of 353 screened patients met the inclusion and exclusion criteria and composed the four cohorts (39, 47, 64 and 63 patients for Group 1, Group 2, TCI and PACT, respectively). Baseline demographic characteristics revealed no statistical differences between the comparative groups except for there were statistically significantly more patients with mental health diagnosis in Group 2 compared to Group 1 (53.19 vs. 2.56 percent). There were no statistically significant differences in quit rates between the relevant comparisons (17.95 vs. 12.77 for Group 1 vs. Group 2; and 9.38 vs. 9.52 for TCI vs. PACT). Dual nicotine replacement therapy was predominantly prescribed in the group clinics while monotherapy nicotine replacement therapy was prescribed more in the individual clinics and more so in PACT clinic compared to TCI. For all cohorts, the main motive for quitting tobacco was health concerns. For the secondary outcome, the trend for hospitalizations was lower in patients who had quit tobacco at 6 months than those that did not quit.

Conclusion: Data suggest that 6 months quit rate was not statistically significantly different between the comparative cohorts despite the change in clinic structures and change in psychology provider. There was also no difference in quit rate between the individual clinics. The group clinic cohorts seemed to use more dual nicotine replacement therapy formulations compared to the individual clinic cohorts, and the TCI providers used more dual therapy compared to the PACT providers. Finally, the trend for hospitalizations was higher in patients who did not quit at 6 months than those who did quit.

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Session-Board # - 7-020

Poster Title: Knowledge, confidence, and motivations of pharmacists in providing tobacco cessation services

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: The negative effects of tobacco use are multifold on patients' health and lives, but also on the healthcare system. To understand pharmacists' perceptions, knowledge, and confidence in providing tobacco-cessation services, three surveys were administered to pharmacists to assist in the development of a comprehensive tobacco cessation implementation toolkit to increase pharmacists' knowledge and confidence in providing tobacco cessation services.

Methods: PSW electronically distributed a statewide survey (hereinafter referred to as "statewide survey") to pharmacist members of PSW to assess pharmacists' confidence and knowledge in providing tobacco cessation services ("services"). The questions of the statewide survey were developed and reviewed by the Wisconsin Department of Health Services, Tobacco Prevention and Control Program; University of Wisconsin-Madison Center for Tobacco Research and Intervention; Pfizer; and PSW.

A tobacco cessation advisory group was also formed to engage Wisconsin pharmacists with additional expertise in providing services practicing in various settings. Information regarding best practices and opportunities was solicited from the advisory group to assist in the drafting of a tobacco cessation service implementation toolkit. The intent of the toolkit is to increase pharmacist confidence and knowledge in service provision. Once drafted, the toolkit was sent electronically to 19 Wisconsin pharmacists for review. A survey was collected prior to and post toolkit review to assess for improved confidence and knowledge in service provision after

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toolkit review (hereinafter referred to as “pre-survey” and “post-survey”, respectively). The questions were developed and reviewed by Pfizer and PSW.

Results: 135 responses were received through the statewide survey; 88 percent of pharmacists believe tobacco cessation counseling is an appropriate service to provide, 89 percent believe it is their professional responsibility to provide, and 94 percent were interested, very interested, or neutral. Patients asking for help is the largest motivator to provide services. Limited time with patients and feeling that patients are not engaged in their quit attempt were barriers. Most pharmacists would provide services if they could attain a collaborative practice agreement and more would through a statewide standing order. Sixty percent of pharmacists believed little or no reimbursement is available for service provision, 68 percent said the addition of reimbursement would increase their motivation to provide services, and 80 percent said they would provide services if Medicaid reimbursement was available.

The response rate for the pre-survey and post-survey was high at 63 percent and 47 percent, respectively. After toolkit review, pharmacists improved confidence and knowledge in service provision. Pharmacist comfort levels with counseling improved from 80 percent to 88 percent; knowledge of methods for financial sustainability of service provision improved from 35 percent to 59 percent; and comfort with motivational interviewing techniques improved from 62 percent to 71 percent.

Conclusion: Pharmacists believe it is their responsibility to provide tobacco cessation services to their patients and are interested in investing their time and expertise to help patients who are motivated and engaged. To support these professional services, scope of practice and financial sustainability models must be improved. Pharmacists show interest in providing tobacco cessation services through a collaborative practice agreement or a statewide standing order. The implementation of a toolkit with supplemental, non-medication related information about tobacco cessation service provision demonstrated improved pharmacist confidence in educating on tobacco cessation, financial sustainability models for pharmacist-provided tobacco cessation services, and motivational interviewing techniques.

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Session-Board # - 7-021

Poster Title: Pharmacist driven hepatitis B screening and/or vaccination in patients treated for hepatitis C

Poster Type: Descriptive Report

Submission Category: Ambulatory Care

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Purpose: Hepatitis B screening and vaccination of susceptible patients initiating therapy for hepatitis C is recommended by the American Association for the Study of Liver Disease (AASLD) and Infectious Disease Society of America (IDSA) based on evidence of hepatitis B reactivation in these patients.

The hepatology clinical pharmacist at our institution works under a collaborative practice agreement and manages all of the education, pharmacotherapy, and laboratory monitoring for patients on hepatitis C treatment. Additionally, the pharmacist reviews patients' immunization history to identify care gaps and to determine the need for recommended vaccinations.

Methods: Following referral for hepatitis C treatment, the hepatology clinical pharmacist reviewed patients to determine hepatitis B surface antigen, hepatitis B surface antibody, and hepatitis B core antibody status. The pharmacist ordered screening for patients with no documented hepatitis B serologies or incomplete serologies. Vaccines were ordered by the pharmacist for susceptible patients. Susceptible patients were defined as those with a negative hepatitis B surface antibody who had not completed the recommended three-dose vaccination series or did not seroconvert after vaccination completion.

Results: Between November 1, 2014 and December 31, 2017, 495 patients were treated for hepatitis C in our clinic. Three hundred eighty-eight patients were screened prior to referral, and 15 patients initiated vaccination without prior screening. Of these 403 patients, 202 were immune pre-referral (by exposure or vaccination completion). However, five patients who completed vaccinations did not seroconvert. Eight-eight of the 92 patients who were not

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previously screened or vaccinated were screened by the pharmacist. Twenty-three of these patients were determined to be immune, and 65 remained susceptible. Vaccination series has been completed or is currently in progress for 44 of the 65 susceptible patients. Of the remaining 21 patients, 19 started vaccination during treatment, however did not complete their series once treatment ended. The pharmacist also completed vaccination for 57 patients with incomplete series prior to referral.

Conclusion: Overall, pharmacist involvement during hepatitis C treatment at our institution led to the screening of an additional 88 patients after referral. With the pharmacist's oversight, 402 out of 495 patients treated for hepatitis C during the study period have documented immunity and/or have completed the three-dose vaccination series for hepatitis B. Based on our pharmacist interventions, there was a reduction in susceptibility rates for hepatitis B in patients treated for hepatitis C.

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Session-Board # - 7-022

Poster Title: Knowledge and practice of Lebanese community pharmacists in the self-management of low back pain: a cross sectional study

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Low back pain is a common disorder affecting about 80 percent of people at some point in their life. In Lebanon, community pharmacists can be consulted to advice about this condition, and to reinforce advice given by other healthcare professionals. In the literature, there is little specific information about the quality of care provided in the community pharmacy to people presenting with back pain. The purpose of this study is to determine the knowledge and reported practice of Lebanese community pharmacists advising people who present with acute or chronic low back pain.

Methods: This is a multi-center cross-sectional study conducted in a representative number of community pharmacies across Lebanon. The selection of participants was done by choosing a representative number of pharmacies in all districts of Lebanon. Pharmacists working at a community pharmacy were considered eligible, and those who wished to participate completed a questionnaire. The questionnaire was designed for self-completion by the pharmacist and included demographic questions about the respondent, questions that assessed the knowledge, and questions about treatment to reflect and characterize the nature of practice. The primary outcome was to determine the knowledge and reported practice of the community pharmacists advising people who presented with low back pain. The secondary outcome was to assess the pharmacists' recommendation about education needed in order to improve the quality of advice and care provided to patients presenting with back pain. Data is expressed as frequency,

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and evaluation of primary and secondary outcomes utilized analysis of chi-square and logistic regression.

Results: This cross-sectional study was approved by the institutional review board. The response of 320 community pharmacists was analyzed. The number of pharmacists with good knowledge about low back pain (51.7 percent) was slightly higher than those with poor knowledge (48.3 percent). Those with more years of experience and more hours of practice per week seem to demonstrate better knowledge (Odds ratio [OR] equal 0.146 and 4.603; P equal 0.020 and 0.007 respectively). Oral therapy was the most prescribed dosage form for back pain compared to local patch and local cream (58 percent versus 15 and 27 percent respectively). In the oral therapy, NSAIDs were the most prescribed medications (42 percent). Diclofenac was the most prescribed NSAID (29 percent), while a combination of diclofenac and vitamin B complex was the most prescribed combination. Moreover, 73.1 percent of the participating pharmacists referred patients to the physician once needed. Those with less than five years of experience referred at most (OR equals 2.856, P equals 0.039), whereas, those with postgraduate studies referred less patients to physicians (OR equals 0.484, P equals 0.04). For the secondary outcome assessment, 87.2 percent of the pharmacists agreed that they need educational programs about low back pain management.

Conclusion: Community pharmacists in Lebanon expressed acceptable knowledge about back pain, yet major gaps still exist, particularly in terms of the quality of advice. Hence, more education about low back pain is needed to improve knowledge, and thus provide better quality of advice. Further research would be useful to assess community pharmacists attitudes to support evidence based self management of back pain.

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Session-Board # - 7-023

Poster Title: Impact of a novel, pharmacist-led digital medicine program on medication adherence and hospital utilization in heart failure patients

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Suboptimal medication adherence in patients with heart failure (HF) is associated with increased healthcare utilization. A novel digital medicine program (DMP), Proteus Discover®, was integrated into an intensive, high-touch pharmacist-led care management program to address nonadherence and provide a medium for optimizing medical decision-making and clinical outcomes among HF patients. The DMP captures and shares (with patient permission) objective adherence data, enabling patients, caregivers, and providers to intervene more precisely to address missed or incorrect doses and optimize medication therapies. This analysis evaluates the real-world impact of the DMP on medication adherence and hospital utilization in HF patients.

Methods: Medicare HF patients were identified in hospital or ambulatory clinic settings. A novel digital medicine program (DMP), Proteus Discover®, was integrated into an intensive, high-touch pharmacist-led care management program and offered to these patients. The DMP included DigiMeds™ (medications with ingestible sensors), a wearable patch confirming ingestion, and a mobile application. After informed consent, these HF patients were started on digital versions of their HF medications. The index date was the date of first scheduled ingestion. Clinical pharmacists monitored patients' adherence, medication taking behaviors, and physiology data from the wearable patch through a secure web portal. Interventions included patient and provider outreach, and patient counseling when adherence dropped below 80%. Ingestion adherence (number of ingestions recorded/number of scheduled doses),

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and patient-reported reasons for nonadherence were assessed. Also, 30-day pre- vs post-index hospital utilization and patient satisfaction were evaluated.

Results: A total of 29 patients used the DMP for 77 ± 19 (mean $\pm$ SD) days, with a follow-up period of 165 ± 46 days (age 75 ± 14 years [mean $\pm$ SD]; 65% male; 72% Caucasian; 41% with a psychiatric comorbidity). Mean ingestion adherence was $79.7 \pm 15.4\%$. Integration of the DMP allowed for interventions to be targeted to patients who were nonadherent. The most commonly reported reasons for nonadherence were low health literacy ($n = 8$) and a comorbidity taking precedence ($n = 6$). Mean CHF-related hospital visits per patient within 30 days was lower post-index (0.03, 1 visit total) vs pre-index (0.45, 13 visits total). Of those who completed a satisfaction survey ($n=10$), 90% found the DMP easy to use and 80% agreed the DMP provided accurate information to their care team.

Conclusion: These real-world data suggest that DMP utilization in combination with high-touch pharmacist care management programs can enable timely, targeted adherence interventions and optimize clinical outcomes. Future controlled studies and real-world analyses should assess confirmatory impact of DMP on clinical outcomes, healthcare resource utilization, and workflow efficiency.

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Session-Board # - 7-024

Poster Title: Impact of a pharmacist-led antibiotic audit program at two long term care facilities

Poster Type: Descriptive Report

Submission Category: Chronic / Managed Care

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Purpose: As of January 1st, 2017 The Joint Commission requires elements of performance related to antimicrobial stewardship within nursing care centers. Additionally, the Pennsylvania Department of Health and the Center for Medicare Services require that long term care (LTC) facilities have an antibiotic stewardship program that includes antibiotic protocols and systems for monitoring the use of antibiotics. Investigators sought to assess the impact of antibiotic audits on pharmacist interventions.

Methods: This was a retrospective study of two LTC facilities (159 total beds) comparing pharmacist antibiotic interventions before (January 1, 2017 through December 31, 2017) and after (January 1, 2018 through May 31, 2018) implementation of an audit program. At the end of 2017, the antimicrobial stewardship sub-committee of Infection Control developed a strategy for pharmacist audit of all prescribed antimicrobials which included review upon order entry and weekly based on a computer-generated list. To assist with implementation, empiric treatment guidelines and an intravenous to oral antibiotic conversion policy were developed and approved. To prepare for interventions, all pharmacists completed 12-hours of basic antimicrobial stewardship education. Pharmacists reviewed antibiotic orders for appropriate indication, duration, culture/sensitivity match, and potential conversion to oral alternatives. To evaluate the impact of the audit program, pharmacist interventions were assessed pre- and post-implementation.

Results: Post-implementation, pharmacist antibiotic interventions per quarter increased by roughly 18 times the pre-implementation baseline (22 vs. 1.25). The breakdown of pharmacy intervention types (%) included: indication verification (60%), culture and sensitivity drug match review (16%), potential drug-drug interactions (16%), alternative antibiotic recommendation (5%), dose adjustment performed (2%). The Pennsylvania Department of Health reviewed

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intervention data during an unannounced April 2018 visit and deemed Good Shepherd compliant with CMS antibiotic stewardship expectations.

Conclusion: A pharmacist-led antibiotic audit program increased antibiotic stewardship interventions within a LTC setting.

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Session-Board # - 7-025

Poster Title: Correlation of clinical outcomes with glucose test strip dispensing in patients with stable type 2 diabetes in a Veterans Health Administration Hospitals Network

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Per American Diabetes Association guidelines, part of the disease state management strategies is self-monitoring of blood glucose (SMBG) at home. This is important in preventing uncontrolled blood glucose fluctuations, which can result in serious micro- and macrovascular complications. However, recent studies have also shown that over-testing can lead to increased patient burden and increased healthcare costs. The purpose of this study was to determine how blood glucose test strips were utilized in stable type 2 diabetic veterans in a network of eight Veterans Affairs (VA) hospitals. We also evaluate the costs associated with perceived inappropriate test strip usage.

Methods: The VA Long Beach Healthcare System institutional review board approved this retrospective database review study. The study period was from October 1, 2015 to September 30, 2017. Veterans who had type 2 diabetes with record of stable A1c, filled at least one prescription for test strip from VA pharmacy, and cared for by VA primary care provider were identified. Patients were excluded if they had diagnoses of uncontrolled type 2 diabetes (hyper or hypoglycemia, hyperosmolarity, or diabetes secondary to pregnancy), deceased, or laboratory results suggested that the records were errors (e.g. estimated glomerular filtration rate (eGFR) above 200 ml/min) during the study period. The index dates were defined as the first and last A1c test result dates, respectively. Test strip frequency was categorized as low, moderate and high based on mean daily usage over all prescriptions filled days. Predictors of interest were patient demographics (age, gender, race, body mass index, baseline A1c, baseline

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eGFR, and antidiabetic regimen) and comorbidities (myocardial infarction, heart failure, stroke, kidney disease and foot ulcers). Primary endpoint assessed the factors predicted frequency of test strip use. Secondary endpoint assessed the cost from perceived inappropriate test strip usage by calculating the potential cost avoidance based on prescription filled. STATA version 9.4 was utilized. Statistical significant was set at 0.05.

Results: A total of 25,696 veterans was included in the analysis. 95.99 percent were male with the average age of 68 years. Most patients were Caucasian, followed by African American, Not-reported, and Asian (66.3, 12.4, 11.8 and 4.2 percent, respectively), the remaining percentage (5.3) was a combination of Native American, Native Hawaiian and Multi-race. When comparing moderate to low-frequency users, patients with the following characteristics were statistically significantly more likely to be a moderate-frequency tester: heart failure, stroke, kidney disease, foot ulcer and antidiabetic regimens. When comparing high-frequency to low-frequency users, some demographic characteristics showed to be the predictors that were statistically significantly associated with high-user. Those characteristics were age, race. Also, change in A1c (between first and last index dates) was also a predictor of test strip usage. Other predictors included heart failure, kidney disease, and antidiabetic regimens. Finally, about 20 percent of patients who were not on any antidiabetic medications were prescribing test strips, while about 10 percent of patients on oral medications used more than recommended daily quantity. These two groups contributed to the estimated total cost of 145,000 dollars per year spent due to perceived inappropriate testing at the eight VA sites during the study period.

Conclusion: Anti-diabetic regimens have a robust association with SMBG testing frequency in the study veteran population. Significant characteristics associated with moderate-frequency SMBG testing were comorbidities associated. However, when comparing between high-frequency testing to low frequency testing, some patient demographic and outcome characteristics were found to be predictors of high-frequency tester. Furthermore, the eight VA hospitals appeared to adhere to the guidance set forth by the Veterans Health Administration on test strip dispensing, with two hospitals that may have some opportunities for improvements. Identification and discontinuation of inappropriate test strip dispensed could result in significant cost savings.

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Session-Board # - 7-026

Poster Title: Impact of a value-based insurance design on chronic obstructive pulmonary disease (COPD) medication adherence and health care utilization

Poster Type: Evaluative Study

Submission Category: Chronic / Managed Care

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Purpose: Value-based insurance design (VBID) reduces or waives cost sharing and increases access for medications deemed of higher value relative to their costs. By aligning cost sharing with value rather than cost, VBID delivers a means to simultaneously improve health outcomes and contain health care spend. Long-term medication use is the mainstay of treatment for many chronic conditions such as COPD and effective in reducing adverse health outcomes. The purpose of this study is to evaluate the impact of reduced copays on medication adherence and overall health care utilization for select COPD medications in an integrated delivery system (IDS).

Methods: We conducted a retrospective cohort study using pharmacy claims, medical claims and electronic medical record data from commercially insured patients in the IDS from January 1, 2014 through December 31, 2017. The VBID was implemented on April 1, 2016. Patients aged greater than 18 with at least two pharmacy claims for selected COPD medications from January 1, 2014 through December 31, 2017 were enrolled in the study. Medication adherence, defined as proportion of days covered (PDC) or the number of days of medication available to each patient, was measured every month during the study period. An interrupted time series design with a random effects segmented regression analysis assessed the impact of the VBID on COPD medication adherence both immediately and longitudinally over time. Paired t-tests compared the mean change in pre-intervention versus post-intervention health care utilization. A subset pre/post analysis of healthcare utilization (combined outpatient and inpatient visits) for

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patients who had 6 months of pre-intervention and post-intervention adherence was evaluated before and after the implementation of the VBID.

Results: We identified 1,177 patients that met the inclusion criteria. Patients had an average age of 44 years and were more likely to be female (68%). The majority of patients were taking beta agonist/corticosteroid combination medications (n=810; 69%) and corticosteroids (n= 429; 36%). On average, the PDC was about 2.6% ($p=0.01$) higher after the intervention and continued to increase by an average of 0.3% ($p < 0.05$) per month after the intervention. 131 patients who had 6 months of pre-intervention and post-intervention adherence demonstrated no significant difference in the average number of visits per patient before and after the implementation of the VBID (7.54 vs 7.47).

Conclusion: The implementation of the VBID was associated with improved medication adherence and overall stability in trends during the post-intervention period for COPD medications. Overall, health care utilization was comparable before and after the intervention, but the impact on clinical outcomes and spending requires further evaluation.

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Session-Board # - 7-027

Poster Title: Practice development: implementation of pharmacist-managed early switch from IV to PO therapy using electronic identification at a tertiary academic hospital

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: There is increasing awareness on early switch from intravenous (IV) to oral (PO) therapy of certain drugs with certain medical conditions or focused on antibiotics alone. limited reports on pharmacist-managed switch from IV to PO therapy and no reports were found from Saudi Arabia. This was designed to implement and evaluate practice and outcomes of pharmacist-managed switch from IV to PO program at 1002-bed public tertiary academic hospital at Saudi Arabia to improve patient's quality of life and facilitate implementation to be easily incorporated into a daily practice. This research was approved by ethics committees of King Abdulaziz University Hospital.

Methods: This is a prospective quasi-experimental study. Guideline list of 17 IV medications eligible for the switch from IV to PO and inclusion and exclusion criteria were created and approved by pharmacy and therapeutics committee. IV delivered orders were collected for 5 months (pre-intervention phase) and 5 months (post-intervention phase). system enhancement was made to generate a filtered list of active selected IV orders in selected units showing diet, age and full patients profile which can be exported on excel sheet to easily document and follow up the interventions.

Pharmacists training, educational intervention to health care providers and awareness campaign took place on go-live date, April 15, 2018. Pharmacists export an electronically generated list of active IV orders of adult medical and surgical in-patients who received 1 or more of the selected IV guideline drugs after 48 hours of IV therapy and review the list based on hospital switch from IV to PO guideline and their clinical judgment for eligibility. Eligible orders were sent for investigation through the system to the ordering doctor to switch to the

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oral formulation if appropriate which will automatically hold the order till the doctor takes an action. Pharmacist's interventions and physician's actions were documented on the exported excel sheet on a daily basis for follow up.

Results: Total of 6084 patients were collected from the pre-implementation phase. 321 patients of which were collected and analyzed in the post-implementation phase. 564 recommendations were made by pharmacists, of these recommendations, 260 (46%) were IV orders eligible to switch to PO medications while 304 (54%) were IV orders excluded for not meeting the inclusion criteria.

Of these recommendations, 36 (9%) orders were accepted and implemented, 117 (30%) orders were already switched without pharmacist's intervention, 3 (1%) orders weren't switched as PO alternative was out of stock, 29 (7%) orders were discontinued, 102 (26%) orders expired and not renewed, 5 (1%) patients deceased, 4 (1%) orders switched to another IV medication, 10 (3%) orders were switched to another PO medication, 6 (2%) orders pharmacist thought weren't eligible but were switched by ordering physician, 16 (4%) orders were switched to PO medications upon discharge and only 24 (6%) IV orders continued till patient was discharged.

Conclusion: Pharmacist-managed switch from IV to PO program using electronic identification, educational lectures and awareness campaign had positive implementing a change of practice as a team and on physician's awareness on using PO form whenever appropriate for patient's clinical conditions. There was a significant number of IV medications eligible for the switch to PO form. Using electronic identification ensures timely conversion and saves pharmacist's time assuring continuous implementation of the program. Effective collaboration among healthcare professionals is necessary for success of the program which can be improved by active encouragement to interact and education to improve the understanding of each profession.

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Session-Board # - 7-028

Poster Title: Improved patient access to HCV treatment: DAA inclusion across state Medicaid formularies one year later in 2018

Poster Type: Descriptive Report

Submission Category: Clinical Services Management

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Purpose: The advent of pan-genotypic direct acting antivirals (DAAs) initiated a paradigm shift in hepatitis C virus (HCV) treatment. Since the FDA approved sofosbuvir/velpatasvir (Sof/Vel), restrictions for treatment varied across state Medicaid plans. Many states (38%) restricted Sof/Vel to HCV genotypes 2 and 3. Additional DAAs approved in 2017 include sofosbuvir/velpatasvir/voxilaprevir (Sof/Vel/Vox) and glecaprevir/pibrentasvir (Gle/Pib). AASLD/IDSA guidelines recommend individuals receive treatment regardless of Metavir fibrosis staging and include Sof/Vel and Gle/Pib as first line agents for treatment naïve patients. This study assesses the 50 state Medicaid formularies for HCV treatment eligibility and inclusion of Sof/Vel, Sof/Vel/Vox and/or Gle/Pib as preferred agents.

Methods: An online search was conducted for all 50 United States' Medicaid services. Two different researchers reviewed the most recently updated preferred drug lists (PDL) and prior authorization (PA) forms between 6/1/2018 and 6/11/2018. Each state Medicaid program was assessed for inclusion of Sof/Vel, Sof/Vel/Vox, and Gle/Pib as preferred, non-preferred, or non-formulary agents for all six genotypes. If the state had not yet approved the DAA for use or it was not included on the PDL or PA form, it was labeled "non-formulary." The findings were compared to previously collected data on state PDLs from June 2017 and between states to assess the availability and accessibility of DAA treatments.

Results: Fifty states were included in our results. To qualify for DAA approval, a minimum fibrosis of F3, F2, or F1 was found in 9 (18%), 12 (24%) or 3 (6%) states, respectively. Twenty-six (52%) states have no fibrosis restrictions in 2018 compared to 9 (18%) of states in 2017. Thirty-

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two (64%) and 13 (26%) states list Sof/Vel as preferred or non-preferred, respectively, for all genotypes. Two states (6%) restrict Sof/Vel as a preferred agent for genotypes 2 and 3. Five states do not include Sof/Vel on formulary. Notably, Gle/Pib is preferred for all genotypes in 46 states (92%). One state includes Gle/Pib as a non-preferred agent for all genotypes, and 3 states (6%) do not include Gle/Pib on formulary. Sof/Vel/Vox is preferred for all genotypes in 17 states (34%) and non-preferred in 21 states (42%). One state lists Sof/Vel/Vox for all genotypes except genotype 2, where it is non-preferred. Sof/Vel/Vox was not on formulary in 10 states (20%). Based on these data, all 50 states include preferred drugs consistent with AASLD/IDSA recommendations. This is a vast improvement from one year ago, where only 15 states (30%) recommended Sof/Vel for all genotypes or use in genotypes 2, 3, 5, and 6.

Conclusion: Patient access to DAAs, which provide the highest levels of virologic response, vastly improved since the approval of Sof/Vef. Compared to previous criteria, qualification for HCV treatment now relies less heavily on fibrosis staging. Instead, an increased number of Medicaid programs have lifted minimum fibrosis restrictions and only require chronic HCV diagnosis for eligibility. In addition, 32 programs include Sof/Vef on their PDL and 46 include Gle/Pib, expanding access to agents that yield the greatest sustained virologic response. Improved access to pan-genotypic DAAs will likely decrease disease burden on the healthcare system and improve patients' quality of life.

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Session-Board # - 7-029

Poster Title: Advancing the role of pharmacy technicians to improve discharge medication bedside delivery

Poster Type: Descriptive Report

Submission Category: Clinical Services Management

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Purpose: Discharge medication bedside delivery was implemented at University Hospital in 2014. However, over time utilization declined and turnaround time increased. An internal assessment of the discharge medication bedside delivery program identified both process and personnel barriers. The purpose of this project was to implement an advanced technician role to address discharge medication bedside delivery barriers and increase the rate of discharge bedside medication deliveries.

Methods: The Transition Specialist - Patient Medication Liaison (TS-PML) was developed by a team which included pharmacy leaders, TS-PMLs, and information technology support. The team used plan, do, study, act (PDSA) cycles to enhance the role and design its fit within the discharge workflow. The new discharge workflow and TS-PML role was communicated with pharmacy staff, case managers, nurses, and physicians through various platforms including email, flyers, meetings and/or presentations.

The TS-PMLs targeted patients at high risk for readmission based on a score calculated by the electronic health record (EHR). Their goal was to identify adherence barriers, prescription insurance coverage, and enroll patients in the discharge medication bedside delivery service. Barriers identified were communicated with a pharmacist, case manager, and/or social worker for appropriate interventions. Once the patient had discharge orders placed the TS-PML was alerted through the EHR at which time, they communicated with the hospital retail pharmacy to dispense the discharge medications. The TS-PML delivered the medications to the patient's bedside and documented the completion of delivery in the EHR.

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Data was assessed monthly from September 2017 through February 2018. Metrics assessed included rate of all discharge medication bedside deliveries, rate of discharge medication bedside delivery for patients visited by the TS-PML, rate of medications in hand at discharge for patients visited by the TS-PML, and turnaround time for all discharge medication bedside deliveries.

Results: Baseline discharge bedside medication delivery rates increased from 12.2% to 21.86%. High risk patients interviewed by the TS-PML received discharge medication bedside delivery 14% of the time, compared with a baseline of 6% and had medications in hand at discharge 48% of the time, compared with a baseline of 36%. Bedside medication turnaround time peaked in October 2017 at 4.35 hours and declined to 2.5 hours by February 2018.

Conclusion: Advanced technicians in collaboration with hospital retail pharmacy staff as well as other disciplines within the health-system have enhanced the discharge medication bedside delivery service. Although numbers have improved, additional opportunities to deliver to patients are present. The program will continue to use PDSA cycles to further improve discharge medication delivery rates, number of patients with medications in hand at discharge, and turnaround time.

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Session-Board # - 7-030

Poster Title: Implementation of a comprehensive transitions of care stewardship bundle initiative on Clostridium difficile infection management

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Outpatient management of Clostridium difficile infection (CDI) is associated with higher recurrence rates, potentially due to modifiable factors including treatment selection, medication access and adherence. The purpose of this study is to assess the implementation of a hospital discharge transitions of care (TOC) bundle service that integrates four key components including antimicrobial stewardship intervention, concierge bedside medication delivery, patient education, and post discharge follow-up.

Methods: The Institutional Review Board approved this single-institution, multi-centered, prospective implementation study. Patients aged 18 years and older, diagnosed with CDI who would complete antibiotic therapy for CDI as an outpatient were eligible for enrollment. Patients discharged to a facility with direct medication administration provided from an in-house supply were excluded. The primary outcome was successful implementation (Y/N) of each of the four components of the TOC bundle beginning in December 2017. The antimicrobial stewardship team was alerted to positive C. difficile Toxin B PCR and evaluated the patient for appropriate therapy based on institutional guidelines. Prior to discharge, the patient would receive medication delivery to the bedside with disease state and medication education provided by a pharmacist from the institutional outpatient pharmacy. A follow-up phone call within one week of discharge was conducted to assess medication and follow-up appointment adherence (if applicable) and patient satisfaction with the service (Likert scale, 1 to 5, with 5 being highest). Secondary outcomes include service implementation cost analysis, patient

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satisfaction with TOC service, and 30- and 90-day CDI recurrence rates. Descriptive statistics were used to analyze service-related outcomes.

Results: Among 133 patients evaluated, 63 patients were included. The most common reason for exclusion was discharge to a rehabilitation or nursing facility. Of the patients with prescriptions for oral vancomycin (74.6 percent), 6.3 percent were discharged on a taper. The median duration of therapy remaining at discharge was 10.0 days (interquartile range 8-12). All 4 components were completed successfully in 38.1 percent of patients; at least 3 of the 4 were completed in 50.8 percent of patients; and at least 2 of the 4 were completed in 87.3 percent of patients. The most common reason for an incomplete bundle was missed medication delivery prior to discharge at off-site campuses. An average of 82 minutes was spent facilitating the service bundle per patient. Patient satisfaction with the service was 4.8 on a 5.0 scale. At the time of the call, 87 percent of patients reported antibiotic adherence, and 2.4 percent patients reported any medication-related problems. In addition to the CDI antibiotic, 44.8 percent of patients had additional medications filled, averaging 2.34 (standard deviation 2.11) prescriptions per patient. Among evaluable patients (n equals 60), 30-day recurrence was 5 percent.

Conclusion: The implementation of a TOC stewardship bundle at a multi-campus hospital system addresses several barriers to successful CDI treatment at hospital discharge. The implementation costs and long term impact on recurrent CDI will be valuable to support service expansion.

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Session-Board # - 7-031

Poster Title: Population health service: utilizing care support resources to improve care

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Care Support Resources (CSR) is at the heart of our institution's Care Transformation initiative. CSR provides population management services to patients covered by risk based contracts. The purpose of the CSR program are to 1) improve population health, 2) reduce costs, 3) enhance the patient experience, 4) enhance the provider experience so that the institution can meet the demands of a rapidly transforming health care system that prioritizes value over volume.

Methods: CSR patients are selected for the program using a data driven predictive model that identifies members at risk for future emergency department and inpatient utilization, high health care costs, and whose health care usage can be impacted. Patients must have one of these chronic conditions: asthma, chronic obstructive pulmonary disease, coronary artery disease, diabetes or heart failure. Patients are assigned a nurse case manager or health coach, and pharmacist. An assessment is completed with the patient's input, goals are selected, challenges to improving health are identified, and a care plan is developed. The pharmacist role is patient-specific. Using drug use review, medications are identified that may be indicated but missing, taken but not needed, or dose adjustments needed. Pharmacists work within established collaborative drug therapy management agreements. While enrolled in the CSR program, patients work to modify their health behaviors to reduce their need for health care services and improve health outcomes.

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Results: Population health: The clinical team (pharmacists, nurse case managers and health coaches) focus on care gap closures such as colorectal screening and chronic disease state management. Among patients eligible for colorectal cancer screening, CSR patients were 1.8 times more likely than non-CSR patients (76 percent vs 63 percent) to have received an exam. Among diabetic patients, CSR members were 2.5 times more likely than non-CSR patients (95 percent vs 89 percent) to have received a hemoglobin A1c screening.

Reduced cost: Emergency room (ED) and inpatient utilization was measured from 1 year prior to the patient starting in the program to 1 year after program initiation. We found a 24 percent reduction in ED visits and 31 percent reduction in inpatient visits. Additionally, monthly medical expenses for CSR patients declined by 32 percent. This equates to an annual savings of one million dollars to the health system for the management of 182 members.

Patient experience: Survey data assessing patient satisfaction post-enrollment was measured. Ninety percent of patients reported they could positively affect their own health and had set personal goals.

Provider experience: Seventy four percent of providers reported the program was valuable to their practice and patients.

Conclusion: The CSR program is improving the experience of our patients and providers, while also reducing utilization and cost. Program expansion is planned with new lives and additional disease states being taken on. As our health system continues to transition to value based care, programs such as CSR will become even more vital.

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Session-Board # - 7-032

Poster Title: Impact of short messaging service (SMS) technology in patient outcomes with specialty chronic diseases at a specialty pharmacy

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Per McMullen et al. (2015), healthcare costs are estimated at \$105-290 billion annually due to patient lack of adherence and not taking medication as prescribed. Cell phone ownership rates are at an all-time high in the United States, with short messaging service (SMS) reminders presenting as an inexpensive and simple-to-use opportunity to improve medication adherence, persistence and outcomes. The primary objective of this study was to evaluate the impact of SMS reminders on a patient's adherence rate to a self-administered specialty medication. Secondary objectives were to measure the duration of therapy and patient satisfaction for sustainability of the program.

Methods: This retrospective, chart review evaluated patient records at a specialty pharmacy from November 1, 2016 through November, 30 2017 and was granted exempt status from the institutional review board from the University of Arizona in Tucson, AZ. Inclusion criteria for both groups were age of 18 years old or older by the start of the study period, receiving one of the chronic specialty disease states self-administered medications for cancer, hepatitis C, human immunodeficiency virus (HIV), and inflammatory conditions, and receiving medication from the specialty pharmacy for at least 3 months (at least 1 month for hepatitis C). The SMS group (n=555) received bi-directional text message dose and/or refill reminders. The program came at no cost to patients if they had an unlimited text plan. The non-SMS group (n=17,335) did not receive any SMS reminders. Adherence was measured utilizing refill records to calculate proportion of days covered (PDC). Duration of therapy was calculated utilizing refill records. The

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SMS group received satisfaction survey via text 60 days post enrollment, then every 6 months thereafter. Continuous variables were reported as medians then compared with the independent t-test. Categorical and binary variables were reported as frequencies and percentages. $P < 0.05$ was considered statistically significant.

Results: A total of 17,890 patients were evaluated. For baseline characteristics, only a significant difference in age between groups was identified in oncology and inflammatory diseases ($P < 0.001$). The median PDC for HIV patients was 94.63% for the non-SMS group and 96.5% for the SMS group ($P < 0.001$). The median PDC for inflammatory patients was 90.4% for the non-SMS group and 91.9% for the SMS group ($P = 0.23$). The median PDC for oncology patients was 95.7% for the non-SMS group and 95.8% for the SMS group ($P = 0.79$). The median PDC for hepatitis C patients was 100.0% for the non-SMS group and 100.0% for the SMS group ($P = 0.92$). Median duration of therapy was significantly greater in the SMS group compared to the non-SMS group for all groups: patients receiving medications for oncology (340 vs 266.5 days, $P < 0.001$), hepatitis C (106 vs 101 days, $P < 0.001$), HIV (396 vs 389, $P < 0.05$), and inflammatory conditions (162 vs 160 days, $P < 0.001$). Fifty-two percent of patients in the SMS group completed the satisfaction survey and 93% of those patients rated the program a letter grade of A or B for helpfulness in managing their health and ease of use.

Conclusion: The SMS program was associated with improved adherence in patients with cancer and inflammatory conditions and significantly improved adherence in HIV patients. It also significantly prolonged duration of therapy which may lead to improved clinical outcomes in patients with cancer, HIV, hepatitis c and inflammatory conditions. A high patient satisfaction with ease of use and helpfulness was found with the SMS program. Further studies can validate the utilization of SMS in a broader patient population within specialty chronic diseases.

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Session-Board # - 7-033

Poster Title: Evaluating the effects of a multidisciplinary transition care management program on hospital readmissions

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: To measure the effect of a pharmacist-initiated transitions of care program on 30-day all-cause readmission.

Methods: In 2015, a pharmacist-initiated transitions of care program began at a medium sized Midwestern acute care hospital. At the time of discharge, the transition of care (TOC) pharmacist reviews the patient's medication action plan, ensures a follow-up visit for the patient with their primary care physician (PCP) is scheduled within 14 days of discharge, calls the patient to confirm receipt of all discharge medications, and provides education/interventions as needed to ensure optimal pharmacotherapy. A retrospective cohort design was used to evaluate the program. During program implementation, 25 PCPs from 4 outpatient clinics were matched on patient panel size and clinic location. Discharged patients of thirteen PCPs (intervention cohort) received the program from 9/2015 – 6/2016 (our study observation period) and discharge patients seen by the other 12 PCPs during the same time period were included in the usual care cohort. Patients in both cohorts were followed for 90 days after discharge. The primary outcome was 30-day all-cause readmissions. Logistic regression models were constructed to evaluate the association between patient receipt of the TOC program and 30-day readmissions. Models controlled for patient demographics and baseline healthcare utilization. This evaluation was approved by the institutional review board.

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Results: A total of $n = 492$ patients received the TOC intervention and $n = 379$ were followed in the usual care cohort. Among intervention patients, 9% were readmitted in 30 days vs. 15% were readmitted from the usual care cohort. This difference was statistically significant after controlling for co-variates ($p = 0.002$), (odds ratio: 2.01, 95% confidence interval: 1.28-3.16). Further analyses will examine the influence of patient clustering within physicians and physicians within clinics.

Conclusion: A pharmacist-initiated transitions of care program was effective in reducing 30-day all-cause readmissions.

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Session-Board # - 7-034

Poster Title: Parental acetaminophen use analysis at a community teaching hospital

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: Pharmacy represents 10-20% of the typical hospital budget. Hospital pharmacists must manage medication cost/benefit without compromising clinical outcomes. In 2010, acetaminophen became available as a parenteral formulation at considerably greater cost than its oral equivalent. To address this potential budgetary impact, hospital guidelines were developed to ensure rational use. Subsequently, the cost disparity widened such that the parenteral formulation exceeds oral by over six hundred-fold. With recent integration of acetaminophen into surgical multi-modal analgesia order sets, its use necessarily expanded. This analysis was undertaken to determine compliance with hospital guidelines and appropriateness of order sets in managing parenteral acetaminophen use.

Methods: Electronic Medical Record (EMR) reports of parenteral acetaminophen usage were generated. The EMRs of all adult patients for whom parenteral acetaminophen was dispensed were reviewed. Key data elements were extracted from the EMR including patient demographics; length of stay; diagnosis and, if a surgical procedure, surgical diagnosis and duration; acetaminophen indication, order detail and number of doses administered; concomitant analgesics; and ability to tolerate oral/rectal routes. Results were delineated by surgical and medical indications, mean or medians determined, and ranges detailed. Descriptive statistics were used to interpret the results. Compliance with hospital guidelines was evaluated. For compliance with guidelines of general use, the patient must have met all of the following criteria: contraindication to oral route, contraindication to rectal route and a contraindication to non-steroidal anti-inflammatory agents. Perioperatively, acetaminophen is listed on pre-operative and post-operative order

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sets, which cite that the intravenous route is to be limited to those patients with contra-indications to oral route; pre-checking is not used on the order sets for either route or the inclusion of analgesics; prescribers have preference. Appropriateness of perioperative use (within 24 hours of surgery) was based on contra-indication to oral route. Acetaminophen use for surgical patients was delineated by the operative setting (preoperative, intraoperative and postoperative) and by surgery type. Provision of multi-modal analgesia was detailed and delineated based on surgery type.

Institutional Review Board approved.

Results: One hundred seventeen (117) adult patients received acetaminophen intravenously during Quarter IV of 2017. One hundred thirteen (113) received acetaminophen perioperatively (96%) and four (4) received acetaminophen for medical indications (4%). Acetaminophen was used appropriately, per institution guidelines, for all medical patients; the average number of doses per patient was two.

Of the 113 perioperative patients, ninety-nine (88%) received acetaminophen intraoperatively, five preoperatively, two both preoperatively and postoperatively, and seven postoperatively only. Preoperative and immediate postoperative period use (within 24 hours of surgery) was appropriate. On average, 1.2 doses were administered per patient (range 1 to 9); most (106 or 94%) received only one dose. One patient received intravenous acetaminophen routinely postoperatively for a period longer than the patient had contraindication to the oral route. Thirty-five patients were discharged the day of surgery; eighty (80) patients were admitted to the hospital postoperatively. Evaluating the multi-modal analgesia aspect: of the eighty who were admitted, forty-nine (62%) received non-steroidal anti-inflammatory agents and twenty-two (28%) received gabapentin postoperatively. Twenty-three (23) of the 80 (29%) received routine acetaminophen orally subsequent to intravenous dose(s). Multi-modal analgesia was provided to varying degrees based on surgery type: 45% of obstetrics/gynecological versus 20% of general surgery.

Conclusion: Analysis of data demonstrated appropriate use for medical indications. Guidelines for general use are stringent; thus, medical use represented only 4.2%. Conversely, analysis of perioperative use identified opportunities for improvement: most acetaminophen (86%) was administered intraoperatively. Although the IV formulation is required intraoperatively, many patients can receive a preoperative dose orally. A recent publication demonstrated no difference in post-operative pain scores when patients were administered acetaminophen orally preoperatively vs. intravenously intraoperatively. Another area for improvement is the consistent provision of broader multi-modal analgesia with an emphasis on continuation of acetaminophen orally and increased non-steroidal and/or gabapentinoid use, if appropriate.

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Session-Board # - 7-035

Poster Title: Preliminary results of a national public survey on the perception of pharmacists and the barriers to utilizing pharmacy services

Poster Type: Evaluative Study

Submission Category: Clinical Services Management

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Purpose: The study investigates the public's perception of pharmacists and the barriers to utilizing clinical pharmacy services. Pharmacist roles and responsibilities have expanded from medications dispensing to complex disease state management. However, patient utilization of clinical pharmacy services remains low. Despite this, the general public's perception of pharmacists has not yet been adequately studied nationwide. Therefore, there is a pressing need to investigate the barriers to utilizing pharmacy services and the public's perception of pharmacists to promote the capabilities of pharmacists and to increase patient enrollment in clinical pharmacy services.

Methods: The institutional review board granted exemption status for this study. The initial version of the survey was based on published literature and the input of researchers, pharmacists, and pharmacy students. The survey was test-launched for 3 months in 2017 and then revised following the feedback of 36 participants. The revised survey contained 47 multiple-choice questions and 3 open-ended questions. The first section collected the survey participants' patient demographic information, frequency of visiting a pharmacy, and most visited types of pharmacies. The second section investigated their knowledge of what services pharmacists provide and recorded what services the public had utilized. The third section examined their perception of, confidence and trust in, and advantages of pharmacists. The fourth section investigated the barriers to utilizing pharmacy services. The Likert scale was used with applicable questions. The last section comprised of free text comments to record any additional thoughts about the barriers to utilizing pharmacists and personal views and expectations of pharmacists. Using Survey Monkey Audience Service, the survey was

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distributed nationwide between April and May 2018 and collected over 2000 responses from people who were at least 18 years old. For preliminary data analysis, the demographic information of the participants was analyzed. Their perceptions of pharmacists, pharmacist roles, and the barriers to utilizing pharmacy clinical services were determined through the Likert scale questions and the free text comments.

Results: A total of 2145 people with an average age of 48.10 years old answered the survey. Members of all 50 U.S. states took part in the survey. Most of the survey's participants identified themselves as female (51.33 percent) and non-Hispanic White (74.36 percent). Most participants utilized chain pharmacies (48.63 percent), and most visited a pharmacy once a month (27.64 percent). Although the majority believed that pharmacists could provide different clinical services besides dispensing medications and providing counsel, very few participants had actually utilized the additional services that pharmacists offer. The participants generally trusted pharmacists to fill their prescriptions correctly, and most of them (about 80.41 percent) thought that pharmacists were accessible. However, only 22.29 percent of participants agreed or strongly agreed with the statement that the pharmacists should be able to prescribe medications. The main barriers to utilizing clinical pharmacy services identified through the multiple-choice questions and the free text comments included the lack of advertisement regarding the pharmacy services by pharmacists and other health care professionals, competing services from other healthcare professionals, and a lack of understanding about the rigid training of pharmacists.

Conclusion: The preliminary results of the survey identify the differences between the general public's perception of pharmacists and the important clinical services that pharmacists offer. Pharmacists must take more initiative to educate the general public and even other healthcare professionals about their capabilities and the rigid training that they must undergo. By doing this, pharmacists can better promote the wellness of patients beyond dispensing medications and providing consultation on their proper uses

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Session-Board # - 7-036

Poster Title: Analysis of adverse drug reactions in surgical intensive care unit at tertiary care teaching hospital in Korea

Poster Type: Evaluative Study

Submission Category: Critical Care

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Purpose: Surgical patients would have an increased risk of adverse drug reactions (ADRs) during their admission because of frequent medication changes after interventions. And critically ill patients are at greater risk of having ADR due to the severity of illness and the change of their pharmacokinetic features. However, there are few pieces of information on the frequency and type of ADRs among critically ill surgical patients. The purpose of this study is to analyze the incidence and characteristics of ADRs occurred in Surgical Intensive Care Unit (SICU).

Methods: A retrospective study was conducted from August 2015 through September 2015 in the SICU at a tertiary care teaching hospital in Seoul, Korea. Causality of ADRs were analyzed by the WHO-UMC criteria and severity, pathogenesis, preventability were assessed using validated algorithm.

Results: Total 265 patients were enrolled in the study, mean age was 60.7 years and 60.0 percent of patients were male. In 40 (15.1 percent) of the 265 patients, 48 different ADRs were detected. There is no significant differences in age and APACHE II score, but the length of ICU stay of the ADR group was 1.95 times longer than that of patient group not experiencing ADR (p less than 0.05). The ADRs were most frequently caused by the following drugs: morphine (16.3 percent), esmolol (15.8 percent), and vancomycin (12.5 percent). The most common clinical manifestation of ADRs was gastro-intestinal disorders (28.6 percent), followed by psychiatric disorders (26.8 percent), central and peripheral nervous system disorders (12.5 percent), and

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cardiovascular disorders (10.7 percent). Of the ADRs, 60.0 percent was evaluated as probable ADR, 14.6 percent was severe ADR, and 25.0 percent was preventable ADR.

Conclusion: ADRs were common in SICU patients. The appropriate intervention by pharmacists in the SICU is considered necessary to promote effective drug treatment and to reduce preventable ADRs.

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Session-Board # - 7-037

Poster Title: Effects of designated pharmacist on intervention and cost avoidance in the surgical intensive care unit

Poster Type: Descriptive Report

Submission Category: Critical Care

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Purpose: The prevention of adverse drug events had been documented by pharmacists in critically ill patients. The purpose of this study was to evaluate the effect of the designated pharmacists' interventions, acceptance rate and cost avoidance in the surgical intensive care unit (SICU) at a tertiary hospital in Korea.

Methods: A retrospective observational study was conducted using electronic medical records. The frequencies of the interventions, acceptance rate, and type of interventions were observed. Cost avoidance was calculated from the potential benefit or harm of the pharmacists' recommendations and the expected extension of hospitalization without a pharmacist intervention.

Results: The frequencies of the intervention increased from 0.16% to 0.56% ($p < 0.001$) and the acceptance rate of the pharmacist intervention increased from 69% to 89% ($p < 0.05$). Since the introduction of the designated pharmacist, pharmacists' interventions have expanded into the clinical field, such as total parenteral nutrition (TPN), drug recommendations and sharing treatment plans, possible adverse drug reactions, and therapeutic drug monitoring (TDM). The calculated avoidance cost per month associated with a designated pharmacists' intervention was 9,335,382 won/month.

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Conclusion: With the designated pharmacist, the frequencies of the pharmacists' intervention and the acceptance rate of interventions among the medical team increased. The cost avoidance from the pharmacists' interventions imply a potential economic advantage; therefore, it is necessary to evaluate the further economic effects of the pharmacists' intervention.

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Session-Board # - 7-038

Poster Title: Free-standing emergency departments without pharmacy on-site: how one team provided high-level patient care virtually

Poster Type: Descriptive Report

Submission Category: Emergency Medicine

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Purpose: Pharmacists have had an increasing presence in the traditional Emergency Department (ED) setting; from emergency response to drug information, pharmacists have become a key player in the emergency medicine team. Recently, our health-system opened five 8-bed Free-standing Emergency Departments (FSEDs) that would operate in a lean fashion and not have pharmacy present on-site. This challenged Pharmacy Services to incorporate pharmacists and pharmacy technicians by leveraging innovative virtual health technologies to provide patients with the same level of care as a traditional ED.

Methods: Pharmacy Services was initially allotted 2.0 pharmacists and 2.0 pharmacy technicians to provide dedicated coverage to five FSEDs. Pharmacy worked with nursing and physician partners to define what clinical and operational services could be provided to these sites. At a minimum, pharmacists needed to be available to answer drug information questions, monitor intravenous compounding performed by nursing, order controlled substances and verify inventory refills, and perform order verification. Pharmacy technicians would be responsible for inventory management, nursing education, and individual site adherence to Joint Commission medication management standards.

Results: Currently, 2.0 pharmacists provide dedicated coverage to five sites Monday through Friday from 0700-2300. To provide 24/7 support, coverage is provided by pharmacists who also manage larger Emergency Departments. All services outlined above are provided as well as positive culture review and follow-up for discharged patients. Services are provided utilizing the electronic health record (Epic), mobile communication (Vocera), and telehealth technology (Cisco DX80). Pharmacists spend two days per week staffing in an “on site” capacity allowing

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personal interactions with nursing and providers. This also allows for the opportunity to provide ongoing education. Pharmacy technicians travel to each site twice a week in order to refill the automated dispensing machines (BD Pyxis Medstation™) with medications. Overall, there is a high level of physician and nursing satisfaction with the pharmacist coverage.

Conclusion: This lean model has been highly successful in providing pharmacy services in a Free-standing Emergency Department setting. In an initial Joint Commission accreditation visit, medication management at these sites was identified as a “Best Practice”. Some gaps have been identified, such as medication reconciliation and discharge counseling, which cannot be overcome by current resources and virtual capabilities.

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Session-Board # - 7-039

Poster Title: Evaluation of urinary tract infection treatment in a community hospital emergency department.

Poster Type: Evaluative Study

Submission Category: Emergency Medicine

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Purpose: Urinary tract infections (UTIs) are commonly encountered within the emergency department (ED). Inappropriate use of antibiotics can result in antibiotic resistance and unnecessary side effects. A retrospective chart review was performed on patients presenting to our ED in April 2018 who had positive urine cultures. The primary endpoint of this study is to evaluate treatment appropriateness of discharge prescriptions based on current guideline recommendations. The secondary endpoint is to build an antibiogram and treatment algorithm for UTIs presenting to the ED.

Methods: This retrospective chart review gathered information from patients who presented to our ED in April 2018. Our study included patients over the age of 18 years that had positive urine cultures with a sensitivity report available. Based on the electronic medical records, the prescribed antibiotic, dose, frequency, and duration of therapy was collected and quantified. Culture and sensitivity reports were used to calculate resistance rates. Patient demographics, renal function, classification of UTI, ESBL organism presence, and treatment failure (defined as patients who returned to our ED within 30 days with symptoms of UTI) were also collected. The prescribed antibiotics were compared to European Association of Urology Infection guidelines to identify antibiotic appropriateness of discharge prescriptions. Collected data was stored on a computerized spreadsheet. There is no institutional review board within the hospital, thus prior approval for the study was not required.

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Results: A total of 51 outpatients had a positive urine culture in the ED during April 2018. The mean age was 49 years: 8 males and 43 females, with an average renal function of 106 ml/min. There were 25 (49%) uncomplicated and 26 (51%) complicated UTIs. From the discharge prescriptions, 92% did not coincide with current guideline recommendations; 40% had improper duration of therapy based on indication, 37% had inappropriate medication frequency, and 26% did not receive the indicated antibiotic based on severity of infection. Of the patients whose prescriptions did not coincide with guidelines, 21% (11 patients) returned to our ED within 30 days for treatment failure. Treatment failures may have occurred from inaccurate prescriptions based on indication (63% (7 patients)), insufficient duration of therapy (36% (4 patients)), or receiving antibiotics which the bacteria were resistant to (45% (5 patients)). The most prevalent bacteria was *Escherichia coli* which was resistant to amoxicillin-clavulanate (22%), bactrim (41%), ciprofloxacin (19%), and levofloxacin (16%) and all were susceptible to nitrofurantoin. The second most prevalent bacteria was *Klebsiella pneumoniae* which was only resistant to bactrim (20%). Only 2 isolates tested positive for extended-spectrum beta-lactamase (ESBL), one *E. coli* and one *K. pneumoniae*.

Conclusion: We found that 63% of the patients who experienced treatment failure had a discordance from the guideline recommended therapy. We concluded that a specific antibiogram, based on sensitivity reports from our ED isolates, and establishing a treatment algorithm would be beneficial for our ED physicians when treating outpatient UTI.

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Session-Board # - 7-040

Poster Title: Opioid prescribing at emergency department discharge for headache and migraine following implementation of an opioid-free acute management algorithm

Poster Type: Evaluative Study

Submission Category: Emergency Medicine

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Purpose: Headache and migraine are two of the most commonly encountered disease states in the Emergency Department (ED). Opioid use for the treatment of headache and migraine may worsen outcomes and increase the risk of developing medication overuse headaches. Following the deployment of an opioid-free headache and migraine treatment algorithm in EDs across a health network, we sought to investigate how patient and medication use outcomes were affected by this change. The purpose of this report is to describe how the introduction of this order set affected opioid-prescribing at discharge in the emergency department.

Methods: An opioid-free headache and migraine treatment algorithm was introduced across EDs in a health network in November 2017. Prescribers were not mandated to use the algorithm, but strongly encouraged by a hospital-sanctioned advisory group. We conducted an institutional review board approved retrospective record review to evaluate the differences in several different outcomes based on a 5-month pre- and post- algorithm implementation timeframe. The outcomes included the number of ED revisits, 30-day ED revisit rate, number of patients treated acutely with opioids, change in pain score, admission rate, ED length of stay, and number of opioid prescriptions provided at discharge. For the purpose of this report, we chose to compare opioid prescribing at patient discharge solely in the post-algorithm implementation phase, stratifying the cases into those who received treatment with the algorithm and those who did not.

Results: Over a 5-month period, 1,339 patients were evaluated as part of the post-algorithm implementation phase. Of those, 117 patients (8.7 percent) were treated using the algorithm

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integrated into the electronic health record (EHR). Additionally, 116 patients (8.7 percent) were treated following the algorithm's structure, but the actual order set was not engaged in the health record. Patients treated with the algorithm, either via the EHR or self-constructed (n equals 233; 17.4 percent), were significantly less likely to receive an opioid at ED discharge as compared to those treated without following the prescribed algorithm (0 percent versus 2.7 percent, p equals 0.012). Other benefits were seen in those who adhered to the protocol set forth by the treatment algorithm. ED length of stay was 34 minutes less in those managed via algorithm recommendations (204 versus 238.5 minutes; p less than 0.001) and the absolute pain score decrease was substantially greater (4.85 versus 2.81, p less than 0.001).

Conclusion: In a network of EDs implementing an opioid-free headache and migraine treatment algorithm, the use or adherence to the recommendations of the algorithm resulted in zero prescriptions provided for opioids upon ED discharge as well as greater reductions in pain perception and reduced emergency department length of stay. Initiatives in the emergency department to reduce the quantity of opioids used within the department appear to have roll-over effects into the outpatient setting through their influence on discharge prescribing habits.

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Session-Board # - 7-041

Poster Title: Organized chaos: precepting in a community hospital emergency department

Poster Type: Descriptive Report

Submission Category: Emergency Medicine

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Purpose: Emergency departments (ED) have a dynamic unlike any other unit in a hospital. Patients are constantly improving, declining, moving, stabilizing, discharging or being admitted. Pharmacy presence in ED's is sparse throughout the country and seasoned preceptors in established programs are even more uncommon. The intention of this information is to provide our organized approach to precepting students and residents, in a community hospital ED, for other institutions to successfully initiate or improve their own programs.

Methods: To prepare the learner for the best possible emergency medicine (EM) experience, the primary preceptor sends out several documents for review prior to the rotation. This includes learning experience outline and expectations, relevant primary literature and rotation schedule. Acknowledgement of the receipt of documents is requested to ensure baseline expectations are understood.

Orientation includes review of the aforementioned documents and familiarization with commonly used EM pharmacy resources. Introduction of staff, computer system and physical space in the inpatient pharmacy and the ED is also provided.

Communication of typical ED experiences is vital for rotation success. A learning environment with high volume verbal orders, unpredictable patient presentations and multiple rapid physician questions where the learner has few correct answers is daunting. Acknowledging the inconsistencies, volatility, emotions and varying professionalism is important for learners potentially uncomfortable in that setting. Consistent, on-the-spot feedback with each interaction is important to close loops and ensure the environment is not overwhelming.

Results: Mercy Hospital's EM dedicated pharmacy service was established in 2007 along with an elective residency rotation. The student rotation was added in 2010. Seventeen students and thirty-two residents have successfully completed the rotation since implementation. The

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solid structure of the rotation has enabled learners of vastly different skill levels and interests to have success in this unique rotation experience. Our residency program changed the EM rotation to required as the demand has significantly increased and residents are seeking out our program specifically for the ED rotation. The pharmacist that initiated the EM program & rotation was also awarded 'Preceptor of the Year' from the Minnesota College of Pharmacy in 2011.

Conclusion: An organized and consistent approach in preparing and orienting students/residents in an ED is necessary for success. Discussing the nuances and difficulties of the environment beforehand and maintaining purposeful communication throughout the experience has proven vital for the demands of the rotation. This rotation is a successful and sought after experience in learners of varying levels of education and EM interests. Pre-rotation exposure of content and expectations form the foundation with immediate feedback and consistent communication enhancing the learning and making the overall experience successful.

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Session-Board # - 7-042

Poster Title: Team approach to stroke center certification improves fibrinolytic door-to-needle time in acute ischemic stroke

Poster Type: Descriptive Report

Submission Category: Emergency Medicine

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Purpose: The American Heart Association/American Stroke Association (AHA/ASA) guideline for management of patients with acute ischemic stroke recommend eligible patients be treated with fibrinolytic treatment within 60 minutes of arrival in an emergency department (ED). Retrospective review of ischemic stroke patients treated with fibrinolytics at our institution showed a door-to-needle time that did not meet this recommendation. During this time period, pharmacists worked from a centralized distribution model and had minimal presence in direct patient care areas including the ED. The purpose of this study was to improve door-to-needle times for administration of fibrinolytics to eligible ischemic stroke patients.

Methods: A retrospective analysis of all stroke patients treated in 2017 was completed. Due to process deficiencies identified during the review, a stroke team was formed which included ED physicians, hospitalists, and neurologists as well as interdisciplinary members from nursing, pharmacy, radiology, laboratory, and a stroke coordinator. The team began by creating a Stroke Treatment Mission Statement to guide further actions. Next, a Code Neuro alert was developed based on the Act FAST (Face, Arms, Speech, and Time) model to help clinicians more easily and quickly recognize stroke signs and symptoms. A house-wide paging alert was implemented to activate a Code Neuro and specific goals for door-to-computed tomography (CT), door-to-laboratories, door-to-CT interpretation, and door-to-needle (fibrinolytic administration) as well as quality measures for patient safety were set based on AHA/ASA stroke guideline recommendations. Order sets for stroke care were developed to delineate patient inclusion &

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exclusion criteria for fibrinolytic therapy and a relationship was formed with an academic teaching center to improve diagnostic efficiency and accuracy. Stroke team members met twice monthly to review data and progress with goal achievement. Process improvements were continually identified and education regarding new processes and goals were provided to clinicians including pharmacy, nursing, and radiology to improve safety and efficiency of stroke care.

Results: As part of the improved stroke care process, pharmacists began to respond to ED or inpatient locations where Code Neuro alerts were called. They were tasked with obtaining accurate patient weights, verifying completed inclusion and exclusion criteria checklists, and initiating dose calculations and preparation of fibrinolytic therapy for eligible patients. As a result of this improved multi-disciplinary approach, average door-to-needle times were reduced from 94 minutes prior to implementation to below 60 minutes post-implementation.

Conclusion: As a result of multiple stroke care process improvements developed and implemented by a multidisciplinary stroke team, average door-to-needle time for fibrinolysis was reduced by nearly half to below the 60 minute recommendation. In addition, a two year primary stroke center accreditation was successfully granted.

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Session-Board # - 7-043

Poster Title: Decreasing opioid use for the treatment of headache and migraine in the emergency department and the effect on revisit rate

Poster Type: Evaluative Study

Submission Category: Emergency Medicine

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Purpose: Headache and migraine are two of the most commonly encountered disease states in the Emergency Department (ED). Literature supports that chronic opioid use for headache/migraine treatment may worsen outcomes and increase the risk of developing medication overuse headaches (MOH). A study was conducted within a health network evaluating the use of an opioid-free headache and migraine treatment algorithm with regard to several ED-relevant outcomes. The purpose of this study is to look at how opioid use in the ED for the treatment of headaches and migraines impacted these outcomes, regardless of algorithm use.

Methods: An opioid-free headache and migraine treatment algorithm was introduced across a health network in November 2017. Prescribers were not mandated to use the algorithm, but strongly encouraged by a hospital-sanctioned advisory group. We conducted an institutional review board approved retrospective record review comparing patients treated before and after the implementation of this algorithm. This review included medical records of adult patients (at least 18 years of age) presenting to one of seven network EDs with a primary diagnosis of headache or migraine during either a five month pre-algorithm or five month post-algorithm time period. Pregnant patients and those with a diagnosis of stroke, infection, head trauma, dental pain, glaucoma, or cancer were excluded. The primary outcome measure was ED revisit rate. Secondary outcomes included 30-day ED revisit rate, change in pain score, admission rate, and ED length of stay. For this analysis, patient records were grouped based on whether or not they were treated with opioids in the ED and evaluated for the outcomes listed in the primary study.

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Results: A total of 2,953 patient encounters were evaluated in this analysis, and included those from both the pre-algorithm and post-algorithm time frames. 335 patient encounters were included in which patients were treated with an opioid in the ED (opioid group), compared to 2,618 in the group who did not receive an opioid during their ED stay (non-opioid group). Both the overall ED revisit rate (9.7 percent versus 19.4 percent, p less than 0.001) and 30-day revisit rate (6.3 percent versus 15.2 percent, p less than 0.001) were significantly lower in the non-opioid group compared to the opioid group. In addition, hospital admission rates (3.2 percent versus 12.2 percent, p less than 0.001) and median ED length of stay (182 minutes versus 216 minutes, p less than 0.001) were lower in the non-opioid group.

Conclusion: Opioid use in the ED to treat patients with headaches and migraines may have several negative ramifications including higher revisit rates, hospital admissions, and length of stay in the emergency department. Given this, opioid use for headache and migraine management in the emergency department should be discouraged and alternate therapeutic interventions should be utilized.

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Session-Board # - 7-044

Poster Title: Drug related problems in emergency department at a major tertiary hospital in Riyadh, Saudi Arabia; a prospective, observational study

Poster Type: Descriptive Report

Submission Category: Emergency Medicine

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Purpose: Drug related problem (DRP) is an event involving drug treatment that actually or potentially interfere with the patient's experiencing an optimum outcome of medical care. Pharmaceutical care services have been developed to optimize drug therapies and ensure medication safety by identifying and solving DRPs in hospital settings. The aim of this study is to identify the most common types of DRPs and the medication classes related to these DRPs among patients admitted to the Emergency Department (ED) within the first 48 hours of admission and to find out the impact of the ED clinical pharmacist in identifying and solving DRPs.

Methods: A prospective, observational study was performed, using Patient Data Collection Sheet (PDCS) conducted between 1 to 31 May 2016. All adult patients ageing ≥ 18 years of age who admitted to the ED for at least 48 hours and required pharmacological intervention were included in this study. All DRPs were identified and recorded as part of the routine clinical pharmacist daily job duties. The treating physician was notified for any DRP that needs an intervention. The study has been approved from Ethics and Research Committee in the hospital. All Categorical variables were presented as frequency and percentages. Continuous variables were expressed as Mean $\pm$ S.D. Chi-square test was used to determine the significant relationship between the study outcomes and categorical variables.

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Results: A total of 171 patients with mean age of 56.36 ± 20.14 years included, 60.2% were adults and 39.8% were elderly. A total of 118 DRPs were reported; 85.5% were preventable by clinical pharmacists. The majority of patients had no comorbid conditions (37.2%). Most DRPs were committed by resident physicians (52.7%). Among studied patients, 48.2% had at least one DRP and 51.8% without any DRPs. The most frequently DRPs recorded were unnecessary drug therapy (42.9% of total DRPs), followed by drugs need to be added (16.8%), adverse drug reactions (15.1%), high dose (11.8%), low dose (10.1%) and ineffective drug therapy (3.4%). The incidence of DRPs varied among various drug classes. The most frequently drug classes causing DRPs were antibiotics (35.5%), anticoagulants (14.3%), anti-hyperglycemic agents (9.2%), and antihypertensive drugs (10.1%). With regard to antibiotics and anticoagulants, the most common DRP encountered was unnecessary drug therapy. Whereas, the most common DRPs among anti-hyperglycemic agents is drug need to be added. Adverse drug reactions were the most observed DRPs among antihypertensive drugs.

Conclusion: This study showed the importance of clinical pharmacists in identifying potential DRPs in emergency department. The rational use of various drugs; especially antibiotics, in ED is very important in order to avoid its unfavorable consequences and to improve the clinical outcomes among admitted patients. These findings require further studies to show the impact of clinical pharmacist in improving quality of care among patients admitted to the emergency department.

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Session-Board # - 7-045

Poster Title: Assessing acute pain management in the emergency department in a Lebanese hospital

Poster Type: Evaluative Study

Submission Category: Emergency Medicine

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Purpose: Pain is a major health problem and is the most common reason for emergency department (ED) visits. Under-treatment of pain in the ED remains a common and pressing problem. The aim of this study was to assess the adequacy of acute pain management in the ED according to the WHO guidelines.

Methods: Adult patients suffering from acute pain who visited the ED of a tertiary care center in Lebanon during the months of November and December 2017 were included. Pain intensity was assessed using an 11-point numeric rating scale (NRS) in which patients rated their pain intensity from 0 ("no pain") to 10 ("worst possible pain"). Pain was classified as mild (NRS scores 1–3), moderate (NRS scores 4–6), and severe (NRS scores 7–10). Appropriateness of pain management was assessed according to the WHO pain management guidelines 2013; the first-line pharmacologic agent for mild to moderate pain is acetaminophen or a nonsteroidal anti-inflammatory drug (NSAID) and weak opioids can be added to these agents for moderate pain. Severe acute pain is typically treated with strong opioids.

Results: A total of 51 patients with a mean age of 49.59 ± 19.75 years were included in our study, out of which 31 (60.8%) were females. The most common chief complaint was abdominal pain 24 (47.1%), followed by groin pain 9 (17.6%), chest pain 8 (15.7%), and headache 5 (9.8%). Twenty five (49.0%) patients had severe pain, 22 (43.1%) had moderate pain, and 4 (7.8%) had mild pain.

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Only 4 (7.8%) patients received pain management as per WHO guidelines. Among patients with severe pain, only one patient received an opioid, while the remaining patients received monotherapy with acetaminophen (19 patients), NSAIDs (1 patient), or acetaminophen in combination with antispasmodics (4 patients). Furthermore, among patients with moderate pain, none of them received an NSAID or acetaminophen along with a weak opioid. Instead, they received either acetaminophen monotherapy (13 patients), or in combination with an NSAID (3 patients) or an antispasmodic (6 patients). Finally, among patients with mild pain, 3 patients received acetaminophen, as recommended by the WHO guidelines, while one patient received an antispasmodic.

Conclusion: In our study the majority of patients presenting to the ED with acute pain did not receive WHO recommended pain management. The data suggest that ED physicians need additional education about management of acute pain.

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Session-Board # - 7-046

Poster Title: Utilization of quetiapine during hospitalization and at discharge

Poster Type: Evaluative Study

Submission Category: Geriatrics

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Purpose: It is considered standard of care to review and possibly reduce the use of antipsychotics in patients age 65 and older. This requires a need to evaluate the use of these agents both while inpatient and at discharge. Quetiapine is the antipsychotic used most frequently in our hospitals. The purpose of this study was to review the utilization of quetiapine in elderly patients. Further assessment was conducted in those initiated on therapy during hospitalization with subsequent prescriptions at discharge.

Methods: This retrospective review analyzed the use of quetiapine in patients 65 years and older treated at three community hospitals. A report of all inpatient and discharge orders for quetiapine from 1/1/2016 to 12/31/2016 was generated. Electronic medical records of all applicable patients prescribed quetiapine during their admission were reviewed. Patients were then characterized as continuation of therapy (i.e., no change from preadmission regimen), change in frequency or dose, or a discontinuation of a preadmission prescription; or newly initiated on quetiapine. Further analysis was completed on those patients discharged with new prescriptions that were not taking quetiapine upon admission. Each patient given a new discharge prescription was investigated to assess the indication for quetiapine. Patients without a documented appropriate discharge diagnosis were characterized as having no indication for therapy. The 30 and 90 day readmission rates for this subset was also recorded.

Results: There were a total of 745 patients included in this analysis. 497 (66.7%) had continuations of therapy; 71 (9.5%) had therapy discontinued; 30 (4%) had a dose reduction; 21 (2.8%) had a dose increase; and 126 (16.9%) were newly initiated and subsequently discharged

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on quetiapine. Indications for these 126 patients were behavioral management/agitation 46 (36.5%), delirium 21 (16.7%), dementia related diagnosis 18 (14.2%), anxiety 4 (3%), psychosis 3 (2%), insomnia 3 (2%), and 31 (24.6%) had no documented appropriate indication. Regardless of indication, of those initiated on quetiapine during their hospital stay, 33 (26.2%) were readmitted within 30 days and 25 (19.8%) within 90 days. In total, 46% of patients newly prescribed therapy were readmitted to the hospital within 90 days.

Conclusion: Admissions to medical facilities provide opportunities to review and adjust antipsychotic medications. This class of medications is associated with significant risks in older patients and should necessitate scrutiny prior to prescribing. We found that the vast majority of patients were continued on the same quetiapine regimen and very few had alterations in therapy. In addition, we found that the indication for post-discharge therapy was not well documented for those patients newly initiated during their hospital stay. Prescribing practices and medication reconciliation policies should be created to review and verify the appropriateness of antipsychotic use across the care continuum.

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Session-Board # - 7-047

Poster Title: Nitrofurantoin use in frail, community-dwelling, older adults with renal impairment: a retrospective chart review on safety and efficacy

Poster Type: Evaluative Study

Submission Category: Geriatrics

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Purpose: Nitrofurantoin is recommended as a first-line antibiotic to treat urinary tract infections (UTIs); however, it is contraindicated in patients with a creatinine clearance (CrCl) less than 60 mL/min. In 2015, the American Geriatrics Society updated the Beers Criteria to recommend nitrofurantoin for short-term use in patients with a CrCl as low as 30 mL/min. It is unknown if nitrofurantoin can be safely and effectively used in frail patients with high incidences of UTIs and frequent use of antibiotics. This study evaluated the safety and efficacy of nitrofurantoin for UTIs in medically-complex patients with renal impairment living in a community setting.

Methods: The institutional review board approved this retrospective chart review study. Electronic medical record data was extracted from the Harbor Health Elder Service Plan in Mattapan, MA for all patients treated with nitrofurantoin for UTIs between 10/20/07 - 10/20/17. All patients were nursing-home eligible and enrolled in a Program of All-inclusive Care for the Elderly (PACE). Inclusion criteria consisted of age equal to or greater than 55 years, primary residence in a community setting, CrCl less than 60 mL/min, and nitrofurantoin treatment less than 10 days. Exclusion criteria consisted of prophylactic nitrofurantoin use, patients who died after 4 weeks of treatment, and patients using urinary catheters. Patients were also excluded if sensitivity results demonstrated resistance to nitrofurantoin or patients did not complete the full course of antibiotic therapy. Efficacy was measured as clinical cure, defined as completion of a 5-10 day treatment course with nitrofurantoin exclusive of other antibiotic use. Prescriptions of nitrofurantoin associated

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with International Statistical Classification of Diseases, Tenth Revision (ICD-10) codes of respiratory, hepatic, and neurologic toxicities were used to identify individuals suspected of nitrofurantoin-associated adverse effects.

Results: Of the 66 patients identified from the EMR, 16 patients met the inclusion criteria. The majority of patients were female (87.5 percent), with a mean age of 84.88 years (standard deviation 6.5), creatinine clearance of 46.57 mL/min (standard deviation 6.685), and eGFR of 61.56 mL/min (standard deviation 13.301). All patients were prescribed nitrofurantoin 100 mg by mouth (PO) twice daily (BID) for durations ranging from 5 to 10 days.

Past medical history revealed that 50 percent of patients had a diagnosis of urinary incontinence, 18.8 percent had urinary retention, 62.5 percent had recurrent UTIs, and 68 percent utilized antibiotics in the 6 months prior to the index UTI.

There was an overall cure rate of 87.5 percent. Nitrofurantoin was used empirically for the one case that resulted in treatment failure and susceptibility was never confirmed. The only adverse effect reported was a case of pulmonary fibrosis identified in a patient after completing a course of nitrofurantoin. This patient had no underlying pulmonary disease and was a non-smoker.

Conclusion: This study suggests that nitrofurantoin may be used to treat UTIs in frail, medically-complex patients with CrCl as low as 30 mL/min in the community setting. It is important to have treatment options other than fluoroquinolones and sulfamethoxazole/trimethoprim for patients with recurrent UTIs and frequent antibiotic use to sustain optimal antimicrobial stewardship practices.

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Session-Board # - 7-048

Poster Title: Pharmacist interventions involving patient outreach: early findings of patient outcomes in older adults

Poster Type: Descriptive Report

Submission Category: Geriatrics

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Purpose: As demographics shift to an aging population in the coming decades, primary care will be challenged with addressing the medical needs of older adults with multiple chronic conditions. Deploying pharmacists in primary care offices can reduce the burden of managing the needs of older adults. Pharmacists can address needs related to medications through comprehensive medication management and other interventions in outpatient and home settings. Furthermore, interventions performed by pharmacists can mitigate the negative outcomes related medication non-adherence and polypharmacy. The purpose of this study was to investigate the impact of pharmacist interventions on older adult patients in primary care.

Methods: Interdisciplinary home visit teams consisting of nurses, community health workers, and pharmacists were deployed in primary care offices to reduce the burden of managing the care of older adults. This am-bidirectional cohort study examined patient outreaches performed by pharmacists in patients aged 60 or older at four primary care practices. Pharmacist interventions were performed in varying delivery modes for patient contact. The delivery modes of pharmacist interventions studied include home visits, office visits, and telephone outreaches. The primary outcome of this study was the measurement of emergency department (ED) visits and hospital admissions in older adult patients. Secondary outcomes measured cost avoidance from pharmacist interventions. The number and types of interventions were collected and assigned a cost avoidance amount based on documented estimates from other studies.

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Results: Pharmacists performed more than 150 home visits and 180 telephone outreaches in 51 older adult patients. In patients with home visits performed by pharmacists, the total number of ED visits 6 months prior to the initial pharmacist outreach was 69. Six months after the initial outreach was performed by the pharmacist, the total number of ED visits decreased to 48. The total number of hospital admissions prior to pharmacist outreach was 25. This number decreased to 16 hospital admissions after pharmacist outreach.

Pharmacist interventions associated with cost avoidance included comprehensive medication review, preventing or managing adverse drug events, medication discontinuation, and adjusting dosage or frequency of medication administration. Total cost avoidance from pharmacist interventions is estimated to be \$249,229 annually.

Conclusion: Clinical pharmacists have a unique role in improving outcomes of older adult patients by aiding in the identification and resolution of medication related problems, providing education to patients and caregivers, and working closely with clinicians to implement drug therapy interventions. Early investigations of this study indicate that pharmacist interventions performed during home visits, along with the care coordination of the nurse and community health worker, may be associated with fewer ED visits and hospital admissions, and increased cost avoidance.

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Session-Board # - 7-049

Poster Title: Prescribing patterns and healthcare costs among patients with gout

Poster Type: Descriptive Report

Submission Category: Geriatrics

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Purpose: The economic burden of gout is substantial and has been reported heavier in poorly controlled gout patients. As such, this study was conducted to compare the health care costs and utilization patterns between patients with frequent and infrequent gout flares. In addition, the prescribing pattern for gout flare management was examined.

Methods: The Longitudinal Health Insurance Database (LHID) 2010 were used. Gout cases were identified, and the numbers of gout flares in a year were calculated based on the following criteria: 1) the number of outpatient or emergency room visits with both a primary or secondary diagnosis of gout and a prescription for acute gout medications (i.e., oral colchicine, systemic NSAIDs or corticosteroids) without chronic gout treatment (i.e., allopurinol, benzbromarone, probenecid or sulfinpyrazone), and 2) the number of inpatient admissions with both a primary diagnosis of gout and a prescription of acute gout medications while in hospital. The infrequent gout flare (<3) patients were matched at a 1:1 ratio with frequent gout flare (≥ 3) patients. All-cause and gout-related medical utilization and costs were calculated. The chi-square test and the t-test were used to compare the two groups' demographics, medical utilization and costs. The adjusted odds ratios (ORs) for the risk of having at least one inpatient / ER visit and the adjusted incidence rate ratios (IRRs) for the numbers of total / outpatient / inpatient / ER visits were calculated and compared between two groups. The two groups' costs were compared using the Wilcoxon rank sum test and the generalized linear model (GLM) with gamma distribution and log link. In additions, types of medications used within the 14-day gout flare period were examined.

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Results: Out of 993,332 beneficiaries, a total of 21,376 gout patients met the gout inclusion criteria and a total of 3,561 had frequent gout flares a year. Average all-cause utilization (35.9 vs. 30.7; $P < 0.001$) and gout-related utilization (22.7 vs. 15.6; $p < 0.001$) were higher in frequent gout flare patients than in those with infrequent gout flares. The median gout-related cost (USD \$369 vs. \$287; $p < 0.0001$), but not all-cause costs ($P = 0.25$) were higher for frequent gout flare patients than for infrequent gout flare. In addition, over 55.8% of the flares were treated with colchicine + NSAIDs.

Conclusion: Patients with frequent gout flares had higher healthcare utilization and gout-related healthcare costs, but not higher all-cause healthcare costs.

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Session-Board # - 7-050

Poster Title: Incidence, nature and causes of medication errors at home healthcare in Qatar

Poster Type: Descriptive Report

Submission Category: Home Care

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Purpose: Medication errors (ME) among home healthcare patients is a major global concern. Epidemiological studies originating from USA and Canada has documented a very high prevalence (up to 40%) of inappropriate and erroneous medication use among non-institutionalized population and homecare patients. Given the fact that homecare patients are frequent medication users, the nature of their illness and age, these patients are more susceptible to adverse medication effects. To stimulate development of interventions to enhance quality of medication use, there is an urgent need to gather information on quantity, nature, causes of medication errors among this vulnerable population.

Methods: The study was conducted at home healthcare setting of Hamad Medical Corporation (HMC) (a state funded teaching institution). This is a retrospective analysis of all the medication incidents pertaining to home healthcare submitted to RL6 (incident monitoring system). The data was collected for a period of 24 months from January 2015 through December 2016. The study protocol was approved by Medical Research Center at HMC, Qatar. HMC has adopted NCCMERP definition of ME. The incidence was calculated by dividing the number of homecare reports to the total number of reports submitted to RL6 (RL6 also comprises reports of 11 other facilities). The reports were further categorized to different type of medication errors (e.g. Prescribing errors, administration errors, dispensing errors etc.). The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) classification was used to demonstrate the severity of ME. The study further systematically analyzed the reports based on

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a theoretical model, Reason's Accident Causation model to classify the causes of medication errors based on Active Failure, Error provoking conditions and Latent failures.

Results: Of the total reports submitted only 341 (2.5%) were reported from home healthcare. Medication Administration errors were the most commonly reported errors (48%), followed by monitoring error (19%), dispensing error (15%), prescribing errors (11%) and transcribing error (6%) being the lowest reported. Most of the reporters failed to reveal their identity whilst just 15% of the reporters identified themselves to be pharmacist. Wrong dose and wrong frequency accounted to almost half of the reported ME. Antibiotics (29%) were the common classes of drugs involved in the errors followed by anticoagulants/antiplatelets (21%). According to James reasons theoretical model, approximately sixty-four percentage of the submitted incidents were reported to have occurred due to Active failures that included, slips, lapse, mistakes and violation and the rest were categorized to 'error provoking conditions' and 'Latent failures'.

Conclusion: The current study demonstrates that the overall percentage of MEs reported among homecare patients is 2.5%, however we anticipate that this might be due to lack of staff and lower reporting at homecare facilities. Most of the errors reported were during medication administration and hence interventions should aim at educating care providers and patients. Most of the reporters failed to identify themselves while reporting hence further studies should aim to explore culture and practice among healthcare professionals at the given facility. Findings also demonstrate that most of the errors were reported to have occurred at the 'front end' (Active Failures).

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Session-Board # - 7-051

Poster Title: Impact of patient-controlled analgesia (PCA) smart pump-electronic health record (EHR) interoperability with auto-documentation on chart completion in a community hospital setting

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: The complete and accurate documentation of opioids administered via a patient-controlled analgesia (PCA) pump provides critical information for patient care. Data on a patient's intravenous (IV) opioid requirements are used to convert the IV regimen to oral therapy in preparation for hospital discharge. Incomplete charting of IV opioid requirements may lead to errors in the conversion to the oral equivalent, which may result in under- or over-dosage. This is the first study to evaluate whether the use of PCA-electronic health record (EHR) interoperability with auto-documentation improves the completion of charting tasks for delivered PCA therapy.

Methods: The institutional review board approved this retrospective cohort study. A pharmacist with PCA and EHR training used the EHR to identify 113 patients who had received PCA therapy at Penn Medicine Lancaster General Hospital in Lancaster, Pennsylvania, and whose charts were reviewed. Patients were assigned to one of two groups, those who had received PCA opiates prior to PCA-EHR interoperability (n equals 55) and those who had received therapy after interoperability (n equals 58). Prior to interoperability with auto-documentation, detailed charting of PCA therapy documented three parameters: number of patient attempts, number of doses given, and volume infused in mL. Post-interoperability with auto-documentation, charting of PCA therapy included four parameters: number of patient-requested doses, number of patient-administered doses, total dose delivered in mg or mcg as appropriate for the medication, and total volume delivered in mL. The primary outcome measure was the overall percentage of chart fields completed. Secondary outcome measures

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stratified the chart-field completion rates into five groups: less than 25 percent, 25 percent to 50 percent, 51 percent to 75 percent, 76 percent to 99 percent, and 100 percent.

Results: PCA-EHR interoperability with auto-documentation increased the percentage of chart fields completed from 69.94 percent to 96.97 percent (27.03 percent, P less than 0.001). PCA-EHR interoperability increased the rate of chart-field completion in every group (P less than 0.001) and increased the rate of 100 percent chart-field completion by 71.95 percent (P less than 0.001).

Conclusion: The use of PCA-EHR interoperability with auto-documentation significantly improved documentation in each stratified chart-field completion group, including charts achieving 100 percent completion. Improved documentation of PCA opioid administration may be associated with safer, more effective conversion from IV to oral administration. Further studies will be required to evaluate the clinical significance of these results.

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Session-Board # - 7-052

Poster Title: Impact of smart pump-electronic health record (EHR) interoperability with auto-documentation on infusion-therapy common procedural terminology (CPT) code billing claims at a community hospital

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: To meet Centers for Medicare and Medicaid Services (CMS) billing requirements, an intravenous (IV) infusion therapy claim must be submitted with a Common Procedural Terminology (CPT) code and precise start and stop times. Without these, a claim might be downgraded to a lower reimbursement rate or not submitted. This is the first study to evaluate whether the enhanced documentation of infusion therapy start and stop times provided by smart pump-electronic health record (EHR) interoperability can improve the accuracy and completeness of billing claims at a community hospital as evidenced by CPT codes submission data.

Methods: The institutional review board at Penn Medicine Lancaster General Hospital in Lancaster, Pennsylvania, approved this retrospective cohort study. Infusion therapy billing data was collected for patients who had received treatment in the emergency department (ED) and hospital units outside of the ED (non-ED), including oncology, neuroscience, cardiac telemetry and others. The study intervention was defined as the use of smart pump-EHR interoperability with auto-documentation of infusion therapy start and stop times. All patients who visited the ED and non-ED units during the study periods were included in the analysis, and there were no patient-specific exclusion criteria. Patient volumes are represented as “patient events”. The study evaluated 158,379 patient events (a visit to the ED or one day admitted to a non-ED unit), which were assigned to two groups: those who received infusion therapy prior to auto-documentation (“Pre” group, n equals 78,241) and those who received therapy after auto-

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documentation ("Post" group, n equals 80,138). The number of submitted infusion therapy CPT codes was analyzed in Pre and Post groups by ED and non-ED units and by inpatient (IP) and outpatient (OP) status. The corresponding dollar amounts of submitted CPT codes were calculated using reimbursement rates from Medicare Addendum B 2017. The data were then converted to annualized CPT code volumes and corresponding CMS Addendum B 2017 dollar amounts.

Results: Pre- and post-interoperability, patient events increased from 78,241 to 80,138 (2.4 percent, P equals 0.335). The number of infusion therapy CPT codes submitted increased from 37,035 to 41,746 (12.7 percent, P less than 0.001). The corresponding dollar amounts increased from \$8,472,872 to \$9,620,524 (\$1,147,652, 13.5 percent). In the ED, patient events increased by 2.0 percent (P equals 0.443), while infusion therapy CPT codes submitted increased by 4.0 percent (P less than 0.001). The corresponding dollar amounts increased by \$478,980 (7.4 percent). In the non-ED units, patient admission days increased by 2.8 percent (P equals 0.2). The total number of infusion therapy CPT codes submitted increased by 31.7 percent (P less than 0.001). The corresponding dollar amounts increased by \$668,672 (34.0 percent). The total number of submitted CPT codes increased 13.4 percent for in-patients and 12.3 percent for out-patients. Since the data set did not link therapies to specific patients, statistical analysis of these increases was not conducted.

Conclusion: This is the first study to use CPT codes to document the impact of smart pump-EHR interoperability with auto-documentation on the submission of complete and accurate billing claims. The \$1,147,652 increase in claims suggests that when infusion therapy services are billed accurately and completely, high utilization of these services may have a positive impact on hospital financial performance. These results at a community hospital may help drive adoption of this technology by adding financial benefits to the recognized safety impact of smart pump-EHR interoperability. Further study is required to confirm and evaluate the implications of these results.

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Session-Board # - 7-053

Poster Title: Integration of automated dispensing and inventory systems provides monthly inventory monitoring and improved inventory turns in a community hospital pharmacy.

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: Martin Luther King, Jr. Community Hospital (MLKCH) is a newly-built safety-net community hospital opened in mid-2015. Starting from zero dollars of pharmacy inventory, MLKCH medication inventory grew organically with poor inventory turns and high cost of inventory on hand. Subsequent to an annual physical inventory in 2016, various inventory management methods were applied to streamline the formulary and improve purchasing patterns. Comparing the cadence of annual inventory assessments to daily purchasing, MLKCH sought to leverage automation to estimate cost of medications on hand more frequently without onerous physical inventories to price medications hospital-wide.

Methods: MLKCH explored application of automated dispensing systems (BD Pyxis ES), pharmacy inventory applications (BD Pharmogistics), and hospital clinical information systems (Cerner Millennium) to evaluate inventory on hand. While integrated informatics would argue for the development of an over-arching system, valuation of current inventory stored in automated dispensing systems proved challenging. Automated dispensing systems maintain inventory as dose counts; patient care systems dose in milligrams; revenue management systems bill in chargemaster units, and pharmacy inventory systems order in manufacturer units of issue. Using hospital chargemaster identifiers as primary reference key across all associated applications, a custom Access database application was developed to value the inventory of all medications hospital-wide using current invoice cost per dose stored in the inventory application (Pharmogistics). Output from the custom Access application provided inventory valuation using current acquisition cost for all medications hospital-wide with

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minimal physical inventory required. Non-Pyxis imaging and sterile compounding remained as the only hospital areas requiring a physical count. This internal estimated inventory on-hand was then validated against a physical inventory conducted by an external company at the end of each fiscal year. Coupled with this estimated inventory cost of all medications on hand, electronic invoice reporting allowed tabulation of a rolling 12-month annual purchase report and thus calculation of estimated inventory turns on a monthly basis.

Results: Augmenting an annual physical inventory with an automated monthly estimation of inventory, MLKCH developed an end-of-month process to interpolate total cost of all medications across the hospital, stratify drug cost by area, calculate a rolling 12-month cost report, and estimate inventory turns monthly. Providing rapid feedback on inventory control and formulary constraint methods applied throughout 2017 and 2018, this monthly dashboard reported out the effectiveness (or lack thereof) of various inventory control methods and purchasing controls without the delay inherent in a physical inventory. Over the course of 2017 and 2018 (fiscal 2018), pharmacy inventory turns increased 120%, and inventory on hand decreased by 19% despite a 20% increase in adjusted patient days requiring a 44% increase in rolling 12-month purchases.

Conclusion: Development of informatics methods to quickly interpolate inventory dollars on hand from automated dispensing system inventory data allowed calculation of estimated inventory turns on a monthly cadence included in pharmacy end-of-month business processes. This data provided pivotal metrics in a monitoring system to assess the effectiveness of pharmacy inventory management methods and respond in real time without physical counts. Application of this integrated dose automation analysis improved inventory turns and reduced inventory on hand in a growing community hospital pharmacy.

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Session-Board # - 7-054

Poster Title: Comparison of medication errors detected at small versus large hospital sites utilizing technology-assisted workflow

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: ISMP Guidelines recommend that barcode scanning of base solutions and ingredients should now be considered the minimum requirement for pharmacy IV admixture services. Previous studies have found that IV Room technology is associated with reduced errors. However, only 3.8% of hospitals that are 200 beds). No research has been published comparing medication error detection in small (200 beds) hospitals that utilize a technology-associated workflow (TAWF) system (Baxter DoseEdge®).

Methods: Sites utilizing TAWF ran the intercepted errors and rejected dose detail by technician report, removing any identifiers and duplicates. These reports allowed for the error rate and error categories to be determined. Two sites that participated in the study were classified as small hospitals: St. David's Georgetown Hospital (Georgetown, TX- 111 beds) and Heart Hospital of Austin (Austin, TX- 58 beds). Four sites that participated in the study were classified as large hospitals: IU Health Bloomington (Bloomington, IN – 355 beds), Hallmark Health System (Melrose, MA – 234 bed), Allegheny General Hospital (Pittsburgh, PA – 628 beds), and Maine Medical Center (Portland, ME – 605 beds).

Results: A total of 101,809 compounded sterile product doses (Small hospital, n=4,944; Large hospital, n=96,865) were evaluated across six hospital sites. The number of errors detected at the small sites was 187, and 2,679 errors were detected at the large sites. The small TAWF hospital sites detected errors at a higher rate (3.78%) than the large hospital sites (2.77%). The

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overall error rate for small and large hospitals utilizing TAWF is 2.82%. The frequency average for the top three error reporting categories for the large hospital TAWF sites were incorrect medication (63.30%), incorrect base fluid volume (10.81%), and incorrect medication volume (6.2%). The frequency average for the top three error reporting categories for the small hospital TAWF sites were incorrect medication (72.83%), incorrect preparation/wrong amount (16.30%), and product is expired (6.52%).

Conclusion: Although fewer small hospitals currently utilize TAWF in their IV Rooms, small hospitals possess an equal, if not greater, need for this technology. In addition, the leading error categories for large compared to small hospitals are different.

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Session-Board # - 7-055

Poster Title: Compounded sterile product preparation time at small compared to large hospital sites utilizing technology-assisted workflow

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: First dose medication turn-around times are significant in the inpatient setting. The delay in therapy that results from longer medication turn-around times could result in poor patient outcomes. Additionally, longer time to prepare a product in the IV Room may result in more money spent on pharmacist and pharmacy technician personnel due to prolonged prescription compounding time. This study aims to compare the time for preparation of IV sterile compounding products in small (200 beds) hospitals that utilize a technology-associated workflow (TAWF) system (Baxter DoseEdge®).

Methods: Six sites utilizing TAWF ran a turn-around time by technician report, removing any identifiers and duplicates. These reports were used to determine the time to complete each workflow step (preparation, compounding, and verification). A standard hourly cost for a pharmacist (\$58/hour) and a pharmacy technician (\$16.75/hour) were applied to calculate the per-unit cost to prepare an IV medication at each site. Two sites that participated in the study were classified as small hospitals: St. David's Georgetown Hospital (Georgetown, TX- 111 beds) and Heart Hospital of Austin (Austin, TX- 58 beds). Four sites that participated in the study were classified as large hospitals: IU Health Bloomington (Bloomington, IN – 355 beds), Hallmark Health System (Melrose, MA – 234 bed), Allegheny General Hospital (Pittsburgh, PA – 628 beds), and Maine Medical Center (Portland, ME – 605 beds).

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Results: The average preparation, compounding, and verification times for the small hospital sites were 1.06, 1.41, and 9.63 minutes respectfully. The average preparation, compounding, and verification times for the large hospital sites were 1.11, 2.28, and 8.19 minutes respectfully. The average combined time to complete all three time points was 12.10 for the small hospitals and 11.59 for the large hospitals. Therefore, the total personnel cost to prepare a compounded sterile product (CSP) was \$10.37/CSP at the small sites and \$8.87/CSP at the large sites. It is important to note that the verification time includes the amount of time that the prescription sat before the pharmacist checked it. This caused the verification times for the TAWF sites to be falsely elevated.

Conclusion: Compounding time had a disparity between the small and large hospital sites. Since compounding is performed by a pharmacy technician, this resulted in an additional cost of \$1.57/CSP at the small hospital sites. This can be significant over time, raising the costs of the pharmacy department personnel costs for small hospitals.

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Session-Board # - 7-056

Poster Title: Burden of intravenous compounding errors and impact of gravimetric verification based intravenous preparation workflow solution

Poster Type: Descriptive Report

Submission Category: Informatics/Technology/Automation

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Purpose: Pharmacies in hospitals have adopted volumetric measurement for compounding intravenous (IV) medication for years, which is a multi-step process manually carried out by pharmacists and technicians. Compounding errors in each step can lead to consequences, such as medication wastage and additional time for re-compounding. In addition, undetected compounding errors that reach the patient can lead to preventable adverse drug events (pADEs). Gravimetric compounding with an IV preparation workflow solution can reduce compounding errors by helping a pharmacist detect them early, and lead to cost savings.

Methods: A targeted literature review on IV medication errors (ME), pADEs, medication wastage, and IV compounding labor was conducted using Medline (2003-present), identifying key articles related to the incidence rates of compounding errors during the process for both chemotherapy and non-chemotherapy preparations. Additionally, pre- and post- IV preparation workflow solution implementation data on compounding time was collected from a teaching hospital. An economic model was developed in Excel to assess the impact of gravimetric-verification based IV preparation workflow solution on compounding errors and its consequences.

Results: A base scenario for a pharmacy in a 400-bed teaching hospital with an annual \$8.3 million spending on IV medication and over 145,000 manually prepared IV admixtures was evaluated. Based on literature-based inputs, the model estimated that IV preparation workflow solution can save up to a total of \$4.2 million in IV drug usage and preparations. The majority of

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savings (~\$2.2 million) is driven by reduced medication wastage from unused IV admixtures, re-compounding of erroneous preparations and discarded viable drugs. Additionally, IV preparation workflow solution can reduce the compounding and post-compounding time by 19 percent and 58 percent, respectively, which leads to a total labor savings of about \$125,000. The IV preparation workflow solution may also reduce the pADEs by improving the error detection rate which may lead to a cost savings of over \$1.9 million. Based on the number of IV preparation workflow units, sites, and pharmacy information systems needed for a 400-bed hospital, an investment of approximately \$681,000 for the workflow solution over 5 years and a gradual adoption (100 percent adoption by end of 1st year) will demonstrate a return-on-investment at month 5 of implementation.

Conclusion: This model demonstrated the substantial impact of IV preparation workflow solution on compounding errors that lead to medication wastage, unnecessary labor, and pADEs. Implementing an IV preparation workflow solution in the pharmacy of a 400-bed teaching hospital can lead to over \$4.2 million cost savings per year, which is estimated to be over 50 percent of the total hospital IV medication spending. Features of IV preparation workflow solution such as real-time gravimetric-verification, barcode verification, and electronic documentation can mitigate the compounding error burden in pharmacies and lead to cost savings.

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Session-Board # - 7-057

Poster Title: An evaluation of inappropriate fluoroquinolone prescribing after the implementation of a best practice alert (BPA) in an integrated delivery system

Poster Type: Descriptive Report

Submission Category: Informatics/Technology/Automation

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Purpose: In July 2016, the U.S. Food and Drug Administration approved safety labeling changes for a class of antibiotics, fluoroquinolones, to enhance warnings about their association with disabling side effects and to limit their use in patients with acute sinusitis, acute bronchitis and uncomplicated urinary tract infections (UTI). Despite these guidelines, antibiotic misuse persists and changing clinician prescribing has been a challenge. The purpose of this study was to assess the impact of a BPA on inappropriate (not guideline-concordant) fluoroquinolone prescribing during ambulatory visits.

Methods: A retrospective cohort study was conducted to evaluate the utilization of fluoroquinolones before and after the implementation of an electronic medical record (EMR) alert on June 13, 2017 across an integrated delivery system. The BPA advised against the use of fluoroquinolones for inappropriate diagnoses of acute sinusitis, acute bronchitis and uncomplicated UTI. Ambulatory care fluoroquinolone orders from March 1, 2016 through September 31, 2017 were included in the analysis. Fluoroquinolone utilization was defined as the number of fluoroquinolone orders prescribed. To determine inappropriate fluoroquinolone utilization, the subset of visits that had only one associated ICD-10 code was used. Descriptive statistics were used to describe drug utilization trends and prescribing indicators.

Results: A total of 68,481 fluoroquinolone prescriptions were ordered during the entire study period. Patients with fluoroquinolone orders had an average age of 60 years (range, 1 to 108). There was a 16% decrease in the number of fluoroquinolone orders pre-intervention from March 1, 2016 through September 30, 2016 and a 28% decrease from March 1, 2017 through

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September 30, 2017 with the intervention. Ciprofloxacin was the most commonly prescribed fluoroquinolone in 2016 and 2017 (75% and 73%, respectively) followed by levofloxacin (24% and 26%, respectively). An evaluation of the top 15 visits with fluoroquinolone orders from a single ICD-10 visit showed that “other disorders of the urinary system” (19%) was the most commonly used code. On average, there was a 1% decrease in inappropriate fluoroquinolone utilization.

Conclusion: There was an overall decrease in fluoroquinolone utilization and a modest decrease in inappropriate fluoroquinolone prescribing after the implementation of the BPA, suggesting an opportunity for EMR-based interventions in antibiotic stewardship. However, further studies are required to evaluate the statistical effect of this intervention on inappropriate fluoroquinolone prescribing practices.

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Session-Board # - 7-058

Poster Title: Assessment of the impact and efficacy of alternative therapy alerts as a drug shortage management strategy

Poster Type: Descriptive Report

Submission Category: Informatics/Technology/Automation

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Purpose: Throughout 2018 several injectable opioid medications, including morphine, hydromorphone, and fentanyl were intermittently on critical drug shortage. Reasons for these shortages included discontinuation of certain concentrations, shifts in manufacturing sites, and inability to meet demand. As a result of these shortages, hospitals employed multiple strategies in an attempt to conserve supply of these critical medications. The purpose of this project is to assess the impact and efficacy of alternative alerts to providers at the point of order entry as a drug shortage management strategy.

Methods: Beginning in March 2018, multiple strategies were employed to conserve supply of intravenous morphine, hydromorphone, and fentanyl. A primary strategy was the development of alternative therapy alerts within Epic which would fire when providers attempted to order hydromorphone and morphine. These alerts would notify the ordering provider about the critical shortage with defined alternative therapies which include fentanyl, morphine or hydromorphone. All orders for intermittently dosed intravenous hydromorphone and morphine were configured to fire alternative alerts to the ordering provider at order entry. The alternative alert for intermittent hydromorphone allowed for providers to override the alert and continue ordering hydromorphone. The alternative alert for hydromorphone would not allow providers to continue ordering this medication. The hydromorphone alert was active from March 6th -April 9th and then was reactivated on May 8th due to supply shortage. The morphine alternative alert was active between April 4th-19th. Data collected included dispense

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and verification volumes of hydromorphone and morphine, as well as the alternative alert firing and acceptance rates (provider selected one of the alternative therapies in the alert)

Results: The first implementation of the hydromorphone alternative alert resulted in a decrease in the average number of hydromorphone dispenses daily over the course of the study period from 177 to 55 (69%). The acceptance rate of the alternative alert was 15% (288/1917). During the second implementation, we saw a 55% decrease in the average number of hydromorphone dispenses daily (from 169 to 76) with an acceptance rate of 12% (217/1854). The average number of hydromorphone orders verified daily decreased by 66% (from 159 to 54) during the first phase and by 56% (155 to 68) during the second phase. The morphine alert resulted in an 85% reduction in average morphine dispenses daily from 129 to 20 as well as a 92% reduction in the average number of morphine orders verified (111 to 9). Both fentanyl daily dispenses and order verification did not show notable changes after the implementation of these alternative alerts

Conclusion: Drug shortages require a multitude of methods to conserve supply of affected medications so that patients can receive the best care possible. Implementation of alternative therapy alerts within the EHR appears to be a reasonable strategy to reduce ordering and dispensing of these critical medications. Next steps with alternative therapy alerts include improving functionality to provide better clinical dosing and to improve acceptance rate of the alerts

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Session-Board # - 7-059

Poster Title: Utilization of a clinical decision support tool in automated medication dispensing cabinets to promote dysphagia screening for ischemic stroke patients with a multidisciplinary team approach

Poster Type: Evaluative Study

Submission Category: Informatics/Technology/Automation

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Purpose: Dysphagia, a common complication of stroke, is associated with worse patient outcomes. The Acute Ischemic Stroke (AIS) Guidelines recommend dysphagia screening before oral intake, and one of the stroke quality measures is the percent of stroke patients undergoing dysphagia screening. Aspirin/clopidogrel administrations within 24-48 hours after AIS onset are also recommended and frequently encountered as the first oral intake. We implemented a clinical decision support (CDS) tool in medication automated dispensing cabinets (ADCs) to prompt dysphagia screening when nurses retrieve aspirin/clopidogrel. The purpose is to evaluate dysphagia screening rate in stroke patients before and after the implementation.

Methods: Houston Methodist The Woodlands Hospital (HMTW) is a community hospital opened in June 2017. As the number of stroke patients increased, the multidisciplinary stroke team discussed approaches to improve dysphagia screening rate, including nursing education, informational flyers, and utilization of a CDS tool. HMTW uses Pyxis MedStation® ADCs with a CDS software tool that communicates key educational information and prompts nurses to answer clinical questions before removing a medication from the cabinets.

On November 27, 2017, a CDS question requiring a response from nurses before obtaining an aspirin/clopidogrel tablet was attached to ADCs in the emergency department (ED). Because the majority of stroke patients originate from ED and aspirin/clopidogrel have multiple indications, the CDS tool was only implemented in ED to avoid alert fatigue. The CDS question

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is worded as “Has patient passed dysphagia screen?” ED nurses can respond “Yes”, “No”, or “N/A”. If the answer is “Yes”, nurses are prompted to “Proceed with oral medication”. If “No”, “Contact prescriber”. Dysphagia educational flyers were placed on top of ADCs at the same time. The primary outcome is the dysphagia screening rate among stroke patients measured by American Heart Association/American Stroke Association before and after the implementation of the CDS tool in ADCs. Descriptive statistical analyses were performed, and two-tailed Fisher’s exact test was utilized to analyze the categorical data.

Results: In the two months prior to the introduction of the CDS question in ED ADCs on November 27, 2017, the volume of stroke patients increased considerably in our hospital, but only 62.5% of the patients (5 out of 8 patients from October 1 to November 26, 2017) received dysphagia screening before any oral intake, which prompted the multidisciplinary stroke team to initiate the educational measures and the CDS alert. Overall, in the approximate five months prior to the implementation of the CDS tool, a total of 13 out of 17 stroke patients (76%, July 1 to November 26, 2017) received dysphagia screening. In contrast, in the five months post the implementation, 27 out of 30 patients (90%, November 27, 2017 to April 30, 2018) received dysphagia screening, with a p value of 0.235. The implementation of the CDS tool in ADCs demonstrated numerical improvement in dysphagia screening rate; however, due to the small sample size, the difference is not statically significant.

Conclusion: With the educational effort of a multidisciplinary team and the implementation of a CDS tool in ADCs, the dysphagia screening rate in AIS patients has improved numerically in a newly opened community hospital. We did not find a statistically significant difference probably due to the small sample size. Since aspirin/clopidogrel are the most common first oral intake among AIS patients, the CDS alert effectively prompts nurses to conduct dysphagia screening prior to giving the medication(s). The limitation is that the CDS intervention only has a positive impact on patients receiving aspirin/clopidogrel in ED and not having food/drink before these agents.

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Session-Board # - 7-060

Poster Title: Syringe size utilization in very low flow rate infusions: an analysis of programmable syringe pump data

Poster Type: Evaluative Study

Submission Category: IV Therapy / Infusion Devices

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Purpose: Syringe infusion pumps are used to deliver accurate infusions to patients, frequently at low infusion rates. In August 2016 the Food and Drug Administration (FDA) published recommendations to decrease issues with flow continuity, particularly during very low flow rate infusions of less than 0.5 mL/hr. The first recommendation emphasizes the impact of syringe size on flow continuity and infusion rates; advising clinicians to use the smallest appropriate syringe size for the infusion. This study reviewed syringe infusion pump data to evaluate the syringe sizes utilized for very low flow rate infusions compared to the recommendations to utilize smaller syringe sizes.

Methods: A retrospective review of syringe infusion pump data was conducted using data from 17 inpatient hospitals collected from January 27, 2010 to March 28, 2016. The data does not contain patient specific identifiers or protected health information and the hospitals are not identified in the data. Nine frequently used continuous infusion drugs were selected for further analysis (dexmedetomidine, dobutamine, dopamine, epinephrine, fentanyl, insulin, morphine, norepinephrine, and phenylephrine). Data collected included patient weights, drug concentrations, initial infusion rates, and syringe sizes. The data was assessed to determine the patient weight ranges and the most common concentrations used for each medication. Infusion data for the most common concentration(s) of each medication was then further analyzed for infusion rate ranges and the syringe sizes used.

Results: Data from 4,459,021 infusions was reviewed. A total of 62,566 continuous infusions specific to the nine selected medications were identified for further analysis. The most common

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weight range was 0 – 5 kilograms, accounting for 36.88 percent (N=23,071) of infusions. Out of the most commonly used concentrations, a total of 12,997 infusions with an infusion rate of 0.5 mL/hr or less were further evaluated for syringe size utilization. With the exception of morphine, the 60 mL syringe size was found to be the most common syringe size used for these infusions. On average, 37.81 percent (N= 4,937) of very low rate infusions used syringes of 20 mL or less. Norepinephrine had the highest percentage of infusions using 60 mL syringes (N=171, 59.58 percent). Morphine had a higher usage of 20 mL syringes at 26.74 percent (N=851) versus 20.77 percent in 60 mL syringes (N=661).

Conclusion: Data analysis of syringe infusion pump use demonstrated that the 60 mL syringe size was used for the majority of very low flow continuous infusions. This contradicted the best practice recommendation made by the FDA to use the smallest syringe size necessary to avoid disturbances in the infusion flow continuity. The data supports the importance of education regarding optimal syringe size selection, especially for infusion rates less than or equal to 0.5 mL/hr, such as was published by the FDA in August of 2016. A follow-up study is recommended to gauge if the education has impacted actual syringe size selection.

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Session-Board # - 7-061

Poster Title: Utilization of smart pump syringe delivery and wireless drug library updates to mitigate the impact of intravenous solution shortages

Poster Type: Descriptive Report

Submission Category: IV Therapy / Infusion Devices

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Purpose: In September 2017, Hurricane Maria struck Puerto Rico contributing to the ongoing critical shortage of intravenous (IV) fluids in the United States(ref). During this shortage, the ability to ration IV fluids and maintain consistent medication delivery is critical to maintain high quality patient care. This study describes the technique and results of one medical centers efforts to meet its patient's needs by utilizing the secondary ports of its large volume infusion pumps to administer medications by syringe.

Methods: Manchester Memorial Hospital is part of the Adventist Health System network located in Manchester, Kentucky. It is a 49 licensed bed general medicine and surgical facility with approximately 80 general intravenous infusion devices utilizing a wireless smart pump technology infrastructure. To meet the demand for IV medications during the fluid shortage, syringe entries were built into the Plum 360 (ICU Medical Inc.) large volume infusion pump drug library in place of IV bags. To make the conversion, the drug library was reviewed to identify medications suitable for smaller reconstitution volumes and shorter administration times. Medications identified included antibiotics such as Ampicillin, Aztreonam, Cefazolin, Cefepime, Ceftriaxone, Daptomycin and Meropenem. The edited drug library included three unique medication entries in eight clinical care areas including ED Adult, Anesthesia, ICU, Med Surg, PCU, OB, Ed Peds and Peds. The total volumes for reconstitution ranged from 25 to 50 milliliters and the duration time of administration ranged from 2 to 6 minutes. The bedside clinicians in each of these areas were notified about the change in medication administration prior to new

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drug library installation on the pumps and were educated on medication preparation and administration. Automated cabinetry was stocked with the appropriate medication vials and nursing units were stocked adequately with luer lock syringes.

Results: Prior to the shortage, from 09/01/2016 to 09/30/2017, IV antibiotic syringes accounted for 29.2 percent of all IV antibiotic doses. Piggybacks containing 50 to 100 milliliter total volumes, accounted for a total of 18,325 doses and IV syringes accounted for 7,559 doses. In the drug library, IV piggyback antibiotic entries accounted for 9.6 percent of all medication entries and the total number of IV syringe antibiotic entries accounted for 1.4 percent of all medication entries in the drug library prior to the shortage.

After the shortage, from 10/1/2017 to 12/31/2017, IV antibiotic syringes accounted for 41.3 percent of all IV antibiotic doses. IV antibiotic piggybacks accounted for a total of 3,139 doses and IV antibiotic syringes accounted for a total of 2,209 doses. To accommodate the increased syringe administration, IV piggyback antibiotic drug library entries accounted for 9.6 percent of all medication entries in the drug library and IV syringe antibiotic entries accounted for 4.8 percent of all medication entries in the drug library.

The conversion to smart pump syringe administration has reduced the need for manual IV pushes at the bedside which require 3 to 6 minutes of uninterrupted nursing time.

Conclusion: The study demonstrates that the use of a large volume infusion pump with wireless drug library upload capability can mitigate the impact of the IV solution shortage. Antibiotic syringe delivery on the infusion pump secondary port was used to safely and efficiently ration IV fluids and maintain medication administration to patients. The conversion from IV bags to antibiotic administration by syringe has decreased the total volume of fluids required to administer antibiotics, the time required for the clinician to administer the medications at the bedside and may potentially impact turnaround time and efficiency in key hospital units.

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Session-Board # - 7-062

Poster Title: Analysis of the compatibility of clonidine with frequently used drugs in intensive care units

Poster Type: Evaluative Study

Submission Category: IV Therapy / Infusion Devices

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Purpose: The pharmacotherapy of critically ill patients in intensive care units is extremely challenging. The majority of the drugs is administered intravenously via a central venous catheter. Therefore, the compatibility of the utilized medication is essential for the safe and effective pharmacotherapy. Incompatibilities can result in loss of active agents, a high particle load or toxic degradation products. However, there is a lack of information on many combinations of intravenous drugs. Therefore, we evaluated the physicochemical compatibility of binary combinations of clonidine with eight frequently used drugs in the intensive care unit setting of a German university hospital.

Methods: A survey among 127 nurses of five different intensive care units at the university hospital of Erlangen revealed amiodarone, clonidine, dihydralazine, furosemide, levosimendan, metamizole, milrinone, urapidil and verapamil as frequently used and rather problematic drugs concerning incompatibilities in daily practice.

Drug admixtures of the low and high standard concentrations of clonidine with the low and high standard concentrations of its combination partners were prepared in infusion bags. Samples were drawn at specified intervals after admixture (0 h, 0.5 h, 1 h, 2 h, 4 h, 6 h, 24 h). The samples were analyzed for the absence of visual particles, color change and gas formation. The pH value was measured and the UV spectra were documented between 350 and 750 nm. A change of 0.4 units of the pH value or a change of the UV spectra greater than 0.05 units was estimated as an indication for an incompatible admixture.

The content of clonidine in the samples with physically compatible or uncertain results were quantified with reverse-phase, stability-indicating high-performance liquid chromatography to

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verify compatibility. The HPCL method was validated according to the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use guideline Q2 (R1).

Results: 26 combinations of frequently used drugs with clonidine were investigated physicochemically. The admixture of clonidine and amiodarone displayed visual evidence of precipitation. The pH value of the combination of clonidine and furosemide decreased noticeably more than 0.6 units over 24 hours. Therefore, the admixture was considered incompatible.

The pH value of the admixture of clonidine and metamizole changed 0.4 units over 24 h, which is an ambiguous result.

No evidence of physical incompatibility was observed when dihydralazine, milrinone, urapidil, levosimendan and verapamil were mixed with clonidine.

The amount of clonidine was analyzed via high-performance liquid chromatography and it showed to be within the specification range of 90–110 % of the original content in combination with dihydralazine, metamizole, milrinone, urapidil, levosimendan and verapamil.

Conclusion: The data suggest that clonidine could be simultaneously administered with dihydralazine, metamizole, milrinone, levosimendan, urapidil and verapamil via Y-site drug administration. Further investigations on the amount of the combination partners will be undertaken. In contrast, the administration of clonidine with amiodarone or furosemide via one administration line is contraindicated as the admixtures proved incompatible.

Analysis of binary combinations of the additional drugs will be conducted to develop a compatibility table for the intensive care units, which will enhance the daily work.

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Session-Board # - 7-063

Poster Title: Using smart pump continuous quality improvement (CQI) data to improve clinical outcomes and cost efficiency

Poster Type: Descriptive Report

Submission Category: IV Therapy / Infusion Devices

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Purpose: Smart pumps with continuous quality improvement (CQI) data has been used to augment patient safety and increase pump efficiency. Advance use of CQI data is observing and analyzing trends in medication usage. The goal of our study was to assess the trends of our CQI data and associate with potential improved outcomes and cost efficiency.

Methods: CQI data analysis at Windsor Regional Hospital, a multi-site 500 bed community teaching hospital, is conducted quarterly for report out to our Regional Pharmacy and Therapeutics Committee. Data analysis of our CQI reports revealed intravenous (IV) pantoprazole as top ten in medications infused. Our institution has a pharmacist driven IV to Oral (PO) medication interchange. A retrospective chart review was used to assess the proportion of patients receiving intermittent IV pantoprazole eligible for IV to PO step down. Patients were included if they receive more than one dose of intermittent pantoprazole in October 2016. Critically ill, pediatric, and obstetric patients in addition to those admitted less than 24 hours were excluded. Criteria for automatic conversion includes: clinically stable AND no malabsorption syndrome, severe nausea/vomiting, GI obstruction AND is tolerating other PO medications OR is on a clear liquid diet or greater. Secondary outcomes included: proportion of patients changed from IV to PO, number of pharmacist conversions, time to IV to PO step down, time between eligibility for IV to PO step down to actual conversion and the economic impact.

Results: 151 patients identified as receiving greater than one dose of intermittent IV pantoprazole during month of October 2016. Thirty one patients randomly selected for review, 9 patients excluded per criteria. Of 22 patients included, 17 (77%) were eligible for IV to PO

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conversion. Of the 17 eligible patients, only 9 (53%) were changed to PO. None of the patients changed from IV to PO were completed by a pharmacist. The average time for IV to PO change was 6 days, whereas the average number of days patients were eligible was 4 days. This led to an estimated economic impact of ~\$24000 per year if patients are changed from IV to PO when eligible.

Conclusion: Smart pump CQI data was integral in identifying gaps in IV to PO interchange practices. IV to PO conversion of pantoprazole only occurred in 53% of eligible patients. No pharmacists were involved despite a pharmacy directive IV to PO interchange. Improving this practice could lead to potential cost savings to the organization. Re-education to pharmacy staff and implementation of improved notification and communication of eligible patients will hopefully lead to improved adherence to IV to PO interchange of pantoprazole. Furthermore, smart pump CQI data will be reviewed with a focus on IV pantoprazole to monitor for trends.

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Session-Board # - 7-064

Poster Title: Evaluation of two closed system transfer devices based on the proposed National Institute for Occupational Safety and Health performance test protocol

Poster Type: Evaluative Study

Submission Category: IV Therapy / Infusion Devices

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Purpose: A performance test protocol for closed system transfer devices (CSTD) is currently being developed by National Institute for Occupational Safety and Health (NIOSH) researchers along with healthcare industry representatives and individual researchers. While the current third iteration of the protocol is applicable to both barrier and air-cleaning types of CSTD, it should be noted that this protocol is not yet finalized and subject to change. The purpose of this study was to evaluate two different CSTD based on the most recent NIOSH performance test protocol, NIOSH Docket Number 288-A, CDC-2016-0090.

Methods: The protocol as outlined by NIOSH Docket Number 288-A, CDC-2016-0090 was used for the evaluation of the two CSTD. Propylene glycol, chosen as a surrogate to represent hazardous drugs, was diluted in a 10:1 ratio in water and a ¼ inch stainless steel thermal desorption tube with Tenax TA sorbent 35/60 was used. The air pump flow rate was set to 50ml/min with a task time of 5 minutes. A needle-free membrane-to-membrane barrier and air-cleaning CSTD, a needle-free ISO standard luer lock barrier and air-cleaning CSTD, and a traditional needle and syringe were all evaluated. A positive control was also evaluated by placing one drop of the surrogate onto the chamber platform. An independent laboratory using thermal desorption-gas chromatography-mass spectrometry (TD-GC-MS) analyzed the desorption tubes.

Results: A reconstitution task, an administration task, and a liquid compounding task was completed for each CSTD. Analysis of the desorption tubes showed that all of the tasks completed using each of the CSTD were considered non-detectable as results were below the detectable limit of 25ng/sample. Furthermore, analysis of the desorption tubes used with the

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needle and syringe method yielded a detectable level of 4817ng/sample while the positive control yielded a level of 47,000ng/sample.

Conclusion: These results demonstrate the effectiveness of each CSTD in reducing and limiting any potential hazardous drug exposure during all tasks performed. However, results of this assessment should not be interpreted to represent the performance of all FDA cleared CSTD. It should be noted that all current CSTD on the market are FDA cleared and meet the USP 800 standard. Furthermore, it is crucial to be cognizant of the fact that a CSTD only provides an additional layer of safety and does not take the place of other engineering and safety controls.

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Session-Board # - 7-065

Poster Title: Impact of a simulation-based activity in total parenteral nutrition (TPN) education in a doctor of pharmacy (PharmD) program

Poster Type: Descriptive Report

Submission Category: Nutrition Support

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Purpose: Introducing total parenteral nutrition (TPN) concepts to students may appear abstract and complex. TPN instruction in pharmacy school typically involves calculation-based problem sets, which may not afford a clear process of developing a TPN formula (for example, number of grams of dextrose, amino acid, and lipid) for a patient as well as TPN compounding. Students may not have exposure to individual components of TPN such as electrolyte solution vials and are not familiar with TPN preparation process. The purpose of this project was to identify the impact of simulation-based learning activity (the intervention) in TPN learning outcomes.

Methods: For the Integrated Therapeutics (IPT) III course at Marshall B. Ketchum University, College of Pharmacy, second-year pharmacy students (n equals 40) were introduced to general concepts related to TPN such as the nutritional assessment and screening, macronutrients and micronutrients, administration, and calculation-based problem sets. After the completion of the didactic portion and traditional calculation-based problem sets, students were given a simulation-based learning activity using Demo Dose (Registered Trademark) TPN Compounding Kit [Pocket Nurse (Registered Trademark)]. The Demo Dose (Registered Trademark) TPN Compounding Kit included simulated intravenous electrolyte vials and intravenous bags of lipid emulsion, concentrated dextrose and amino acid solutions, and intravenous sterile water resembling supplies seen in practice. To assess the impact of the intervention, students were asked to complete two identical five-question surveys with a five-point Likert scale: 1. Survey prior to simulation-based activity (pre-survey) and 2. Survey at the conclusion (post-survey) of the simulation-based activity. Use of Wilcoxon Signed-Ranks test was chosen to compare the

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pre-survey to the post-survey because variables are matched and are ordinal in nature. Two-tailed alpha level of significance was set at 0.05. Additionally, a demographic survey was later administered to identify student learning preferences and background.

Results: Thirty-eight students completed the pre-survey, and 36 students completed the post-survey. When comparing the results between the pre-survey and post-survey, there was a statistically significant improvement in all five questions, indicating that the intervention enhanced students' learning outcomes. Students' competency in performing TPN calculations improved (p equals 0.012, z equals -2.516) as well as the proficiency in explaining the compounding process of TPN (p less than 0.001, z equals -3.578). Thirty-six students completed the demographic survey with the majority of students belonging to the 25 to 34 age group (69.4 percent). For learning preferences, approximately 69.4 percent and 66.7 percent of the students marked "listening to a lecture" and "hands-on training" as their ideal learning styles, respectively.

Conclusion: There was a statistically significant impact on student learning outcomes following the TPN simulation-based learning activity. The results show that the simulation-based activity help students perform TPN calculations and explain the process of TPN compounding. It may be beneficial to include simulation-based learning activities as a supplement to the didactic instruction of TPN.

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Session-Board # - 7-066

Poster Title: Relationship between epidermal growth factor receptor mutations and skin disorders in patients receiving epidermal growth factor receptor - tyrosine kinase inhibitors

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Epidermal growth factor receptor (EGFR)–positive non–small-cell lung cancer accounts for approximately 50% of all lung adenocarcinomas. While clinical effects of EGFR-tyrosine kinase inhibitors (TKIs) are reported to be influenced by genetic variants, skin disorders due to anti-EGFR monoclonal antibodies are reportedly correlated with clinical response. However, there is no reports on the correlation between EGFR-TKI induced skin disorders and clinical response, and correlation between EGFR genetic variants and skin disorders. We studied these correlations, of which we here report the results.

Methods: We studied patients who received EGFR-TKIs and were hospitalized in our hospital for 14 days or longer between January 1, 2014 and February 28, 2017. Study parameters based on review of the electronic medical chart included age, sex, EGFR-TKIs used, genetic variant, skin disorders that occurred by Day 14 (assessed according to the Common Terminology Criteria for Adverse Events version 4.0), treatment duration with EGFR-TKIs, response evaluation, and progression free survival. Statistical analysis with the chi-square test was performed for significance, with a significance level of $P < 0.05$. There are currently 594 EGFR gene mutations identified, and approximately 90% of them are clustered in the exons 18-21. In particular, an exon 19 deletion mutation (del 19) and exon 21 point mutation (L858R) are commonly expressed. Therefore, in this study we restrict to del19 and L858R, and rare genetic variants were other.

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Results: Study on correlation between the presence of del19 mutation and skin disorders (grade 2 or more) demonstrated that skin disorders were more common in patients without del19 mutation ($P=0.018$). Study on correlation between the presence of L858R and skin disorders (grade 2 or more) demonstrated that skin disorders were more common in patients with L858R mutation ($P=0.048$). Based on the above, skin disorders (grade 2 or more) were more common in patients with L858R mutation than those with del19 mutation. In addition, serious skin disorders were significantly more common in patients with L858R mutation than those with del19 mutation during the early phase of EGFR-TKIs therapy.

Conclusion: This study suggests that the severity of skin disorders is influenced by genetic variants, and L858R mutation is involved in skin disorders. Although our study evaluated adverse events for 14 days, long-term use of EGFR-TKIs may increase the severity of skin disorders. Self-care from the early treatment stage should be particularly important in patients with L858R mutation to continue treatment. Understanding risk factors in advance appears to be a useful approach to prevent delay in treatment. Our study sample size of 57 patients was small, and further study with larger sample size is warranted.

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Session-Board # - 7-067

Poster Title: Utilization of mutation testing and targeted treatments in non-small cell lung cancer in a large integrated health system

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: The purpose of this study is to describe the utilization of epithelial growth factor receptor (EGFR), anaplastic lymphoma kinase (ALK), and c-ros oncogene 1 (ROS1) mutation testing and prescribing patterns for the respective targeted therapies in non-small cell lung cancer (NSCLC).

Methods: This study was a retrospective review of electronic medical record data (EMR) in an integrated health system. The cohort of patients with NSCLC was obtained from the system's cancer registry. Patients were included if they had a new NSCLC diagnosis between 2014-2017 and had histology available from a biopsy. Patients with Stage IV cancer and either adenocarcinoma, large cell, or NSCLC not otherwise specified histology were considered as eligible for mutation testing. Descriptive statistics were performed on the demographic information. Rates of EGFR, ALK, and ROS1 mutation testing and targeted therapy utilization for EGFR, ALK, or ROS1 positive patients in both the testing eligible and testing ineligible population were calculated for all years and for individual years.

Results: The initial cohort consisted of 1,259 patients which were 43% female with a mean age of 70 years. There were 334 considered eligible for mutation testing. From 2014-2017, 77% of eligible patients received the EGFR test; 17% of EGFR tests were positive and 77% of EGFR-positive patients were prescribed EGFR tyrosine kinase inhibitors. The proportion of ALK and ROS1 testing were 39% and 35% with an increase in the testing rate from 33 to 45% and 19 to

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45% in 2014 compared to 2017, respectively. Of the EGFR negative patients, 60% received ALK testing and 54% received ROS1 testing. Only 4% were ALK positive, but all received crizotinib first-line. The only ROS1 positive patient was treated with crizotinib. Of the group determined not eligible for testing, rates of EGFR, ALK, and ROS1 testing were 44%, 23% and 21%, respectively.

Conclusion: In our integrated health system, real-world NSCLC mutation testing patterns lag behind guideline recommended testing. However, testing rates have increased over time and most mutation positive patients received targeted therapy. Utilization of mutation testing and targeted therapies in non-eligible populations presents opportunities for improvement. Limitations in EMR data may have underestimated testing rates in the eligible population and overestimated rates in the non-eligible population as patients may have received services outside the system. While patient care choices, interruptions in care, and cost of treatment are suspected reasons for discrepancies, further research is needed to target specific areas of improvement.

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Session-Board # - 7-068

Poster Title: Convenience of nivolumab fixed dose schedule

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Most immune checkpoints inhibitors indicated in cancer treatment have fixed dosing regimens. Nivolumab has recently changed recommended dosage from weight-based dose to fixed dose. There are two new fixed-dose schedules, 240 mg/2w and 480 mg/4w. Anti-PD1 fixed dosing vs weight-based dosing offers simplicity when calculating the dose and preparing the infusion at the Pharmacy. Although new dosing protocols are not yet approved for all indications, we aim to calculate the convenience of using nivolumab fixed doses and its economic impact for the patient and the institution.

Methods: We designed a 1-year retrospective study at a 500-bed hospital. All patients who had received at least one dose of nivolumab were included in the analysis. Weight, treatment duration and dose received were collected from the clinical records of the patients and the Pharmacy Department database.

Dilution complexity and extended stability were calculated using the Pharmacy "Risk Matrix" (Good Manufacturing Practice for Pharmaceutical Products at the Hospital Pharmacy, June 2014) for sterile preparations. Preparation time was also measured.

The convenience for the patient was assessed calculating administration time needed per month and the number of visits to the hospital. The administration time is 30-60 minutes, depending on the agency (FDA recommends 60 minutes in all schedules while EMA recommends only 30 minutes for the two-week schedules).

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Economic impact was evaluated calculating the difference between fixed-dosing regimens and the actual dose received by the patient and the time saved during the administration of the drug.

Results: From June 2017 to May 2018, forty patients received nivolumab, half of them for the treatment of non-small cell lung cancer (n=24). Mean weight was 76.5 kg (IQR=19.5). Mean duration of treatment was 77 days (IQR=179.5) for the study period.

Twenty-two (55%) patients would have the dose of nivolumab increased if this was not calculated per kilogram. On average, patients would receive 21 mg ($\pm$ DS 117) more per month if given fixed dose of nivolumab (mean increase 4.6%).

After using the "Risk Matrix", fixed-dosing showed a low risk during preparation, while weight-based dosing had a medium risk, as dose-volume calculation step was avoided during dilution, which allows to extend stability by five days. No significant differences in preparation time were detected.

According to EMA infusion times, there is no reduction in total drug administration time for any dosing schedule but patients receiving the 480 mg/4w protocol would have half the visits ($4.8 \pm$ DS 4.02 fewer during the study period) to the clinic, thus reducing waiting time. According to FDA infusion times, patients would have saved on average 142.7 minutes ($\pm$ DS 120.6) in this period.

Changing from weight-based dosing to fixed-dosing would increase the cost 0.8 %.

Conclusion: Changing from weight-based dosing to fixed dosing in nivolumab treatment has a very low economic impact and it is more convenient for a centralized sterile preparation as its stability can be extended. Except for the four-week schedule, no benefits for the patient are detected.

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Session-Board # - 7-069

Poster Title: Dose rounding policy results in significant cost savings

Poster Type: Descriptive Report

Submission Category: Oncology / Hematology

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Purpose: Antineoplastics are the number 1 therapeutic category by expenditures in non-federal hospitals in 2017, accounting for 18% of total expenditures and increased 3.6% compared to 2016. The rising drug spend requires health systems to continuously evaluate spending and implement cost savings initiatives. Published literature and position papers outline the safety of dose rounding and include potential benefits such as cost reduction and improve dose accuracy. The purpose of this abstract is to report on the cost savings of a dose rounding policy at Kalispell Regional Medical Center in Northwest Montana.

Methods: This is a retrospective review of the cost impact of a new dose rounding policy. The dose rounding policy was approved late November 2017 and covers rituximab, cetuximab and bevacizumab. The policy allows the oncology pharmacist to round doses to the nearest vial size if the prescribed dose is within 5%. All other drugs require the pharmacist to discuss the dose rounding with the prescriber. The oncology pharmacist documents the rationale for the dose adjustment. To determine the cost savings, direct savings were calculated by comparing the prescribed and adjusted doses. In addition, total purchases for all covered drugs were compared for pre-policy period (6/2017-11/2017) compared to the post-policy period (12/2017 – 5/2018).

Results: For the 3 specified drugs, drug spend decreased by \$147,000 or 7% in the 6 month time frame compared to the previous 6 months. Drug spend decreased by \$720,000 or 15% for all rounded drugs which also included cytotoxic chemotherapy and monoclonal antibodies.

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These drugs included cisplatin, cyclophosphamide, doxorubicin, inotuzumab, irinotecan, nivolumab, pembrolizumab, and trastuzumab

Conclusion: Dose rounding of oncology agents can result in significant savings. This approach is supported by published literature and by the Hematology Oncology Pharmacy Association (HOPA) position statement on Dose Rounding of Biologics and Cytotoxic Anticancer Agents which is endorsed by the National Comprehensive Cancer Network (NCCN). Based on these results, the pharmacy department plans to expand the dose rounding policy. Further evaluation on the impact on reimbursement and accuracy of doses is warranted.

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Session-Board # - 7-070

Poster Title: Sensitivity to granulocyte colony stimulating factors in cancer patients

Poster Type: Descriptive Report

Submission Category: Oncology / Hematology

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Purpose: Given the observation of greater sensitivity in certain patients to the administration of granulocyte colony stimulating factors and the difficulty in dosing them to maintain neutrophils within the range of normal values, the following study is performed.

To analyze the factors that may influence the response to the administration of granulocyte colony stimulating factors and the adequacy of their use according to these parameters.

Methods: A population of oncological patients is studied over a period of 1 year (June 16 to June 17) receiving chemotherapy treatment (QT) at Onco-Hematology Day Hospital.

Data are collected through the prescription program of QT (Farmatools® 2.5), the laboratory program (Werfen® 2.0) and electronic medical record (Selene®).

Patients with oscillations in neutrophil levels higher than 24.000 cells/mm³ with respect to the upper limit of normality and lower than 1.000 cells/mm³ with respect to the lower limit of normality are selected.

The tumor type, received QT, characteristics of each patient (sex and age) and administered doses of human granulocyte colony stimulating factor (G-CSF: filgrastim) are analyzed in relation to the neutrophil figures objectified in the analytical.

Results: A total of 1.357 patients and 29.667 laboratory tests were analyzed. In 21 patients (1,5%) significant oscillations were detected in the neutrophil figures between values lower or higher than the normal range.

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The median age of our population was 47 years (30-55 years), with 52,38% men and 47,62% women.

The 42,86% presented germinal tumor; 19,05% breast cancer; 14,29% bladder cancer; 9,52% ovarian cancer; 4,76% endometrial cancer; 4,76% colon-rectum cancer and 4,76% soft tissue sarcoma.

Most of the QT received was bleomycin (42,86%, germinal tumor), with neutropenia of grade III or IV being detected in all cases, supposing delays in the administration of the treatment. The median of the oscillations in neutrophil values in patients with germinal tumor was 500 cells/mm³ (100-1.600 cells/mm³) and 63.600 cells/mm³ (14.800-89.700 cells/mm³) with respect to the lower and upper limit of normality respectively with an average of 4 doses (3-5) administered filgrastim.

Conclusion: The patients with germinal tumor showed the highest oscillations in the neutrophil figures, as well as the greater sensitivity in the response to filgrastim. They were mostly men, young and receiving treatment with bleomycin.

Taking into account that the current literature recommends not to administer filgrastim in the days before the next QT cycle and, given the sensitivity shown in this cohort of patients, it is concluded that they should receive lower initial doses of filgrastim and monitor them more frequently to avoid neutropenia, that can condition the healing of germ cell tumors.

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Session-Board # - 7-071

Poster Title: Economic modeling for the U.S. of intravenous versus subcutaneous rituximab as single-agent maintenance therapy in follicular lymphoma

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Following combination rituximab with chemotherapy for follicular lymphoma, rituximab single-agent maintenance therapy can be administered by either: intravenous (IV) standard infusion (IVS) or 90-minute rapid-infusion (IVR90), or subcutaneous (SC) administration in eligible patients. IV may be with reference rituximab or a proposed biosimilar rituximab. SC rituximab may offer time and cost savings; a proposed biosimilar rituximab offers another potential cost-saving option. The purpose of this study was to conduct a time-and-cost simulation of rituximab single-agent maintenance therapy for follicular lymphoma comparing reference IV rituximab, SC rituximab, and biosimilar IV rituximab from the US payer perspective.

Methods: Simulation analysis for one follicular lymphoma patient with rituximab single-agent maintenance therapy every 8 weeks over two years (12 doses) using: [1] label-recommended administration times, [2] rituximab wholesale acquisition cost (WAC) for the first quarter of 2018 (US\$), and [3] 2018 reimbursement per Current Procedural Terminology (CPT) codes (US\$). Year two WAC and CPT costs were discounted by 3%. Costs for the proposed biosimilar rituximab were extrapolated at 5% decrements of reference rituximab WAC from 15%-35%. IV simulations were replicated for 3 body surface area (BSA)-adjusted doses: small (1.6m^2), average (1.85m^2) and large (2.1m^2) patients.

Results: Over the two-year course of maintenance therapy for follicular lymphoma, rituximab SC administration saves 1380 minutes (or 1h55m/treatment) compared to IVS if $\text{BSA}=1.6\text{m}^2$,

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1549 minutes (2h9m/treatment) if $BSA=1.85m^2$, and 1718 minutes (2h23m/treatment) if $BSA=2.1m^2$. Time-savings with SC is 840 minutes (1h10m/treatment) over IVR90 across all BSA. If $BSA=1.6m^2$, rituximab treatment costs over two years were \$9,052 higher if administered SC compared to IVS and \$9,421 higher versus IVR90; if $BSA=1.85m^2$, SC saved \$446 over IVS and \$259 over IVR90; similarly, if $BSA=2.1m^2$, SC saved \$10,682 and \$10,313, respectively. Costs of rituximab maintenance therapy with SC administration were higher than biosimilar IVS rituximab at all BSA and at all decrements of biosimilar discounts (range: \$1,751 to \$31,154); similarly, costs for SC rituximab maintenance therapy were higher than biosimilar IVR90 rituximab at all BSA and at all decrements of biosimilar discounts (range: \$2,120 to \$31,524).

Conclusion: Use of rituximab SC for single-agent maintenance therapy for follicular lymphoma saves administration time and costs compared to reference IV rituximab except if $BSA=1.6m^2$, in which case SC costs were higher. Costs for SC rituximab were higher than biosimilar rituximab IVS or IVR90 at all three BSA.

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Session-Board # - 7-072

Poster Title: Benefits of a health-system pharmacist-controlled oral chemotherapy medication therapy disease management program

Poster Type: Descriptive Report

Submission Category: Oncology / Hematology

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Purpose: Oral chemotherapy has become more predominant in the treatment of cancer patients due to increases in oral chemotherapy approvals, greater utilization, and a growing elderly population. These agents can cause significant adverse effects and have complex dosing and monitoring requirements. As oncologist workload increases, providers will look to other health care professionals to provide support, positioning pharmacists in a pivotal role to affect patient care. This project was designed to utilize pharmacists in a medication therapy disease management (MTDM) program to offer support and personalized services to patients for safer medication use, increased patient satisfaction, and decreased physician burden.

Methods: Geisinger created the phone-based oral chemotherapy MTDM clinic in August 2013. Patients are enrolled in the clinic through a physician referral that is initiated at the time a new oral chemotherapy agent is sent for prior authorization. Patients are then followed by an oral chemotherapy-trained pharmacist at various frequencies while on therapy. Through a collaborative practice agreement, pharmacists order supportive care medications, prescribe oral chemotherapy refills, and manage labs for medication monitoring. Additional services include patient symptom management, medication dose adjustments, drug interaction monitoring, provider reference, medication education, therapeutic drug monitoring for bone marrow transplant patients, monitoring and management of immunotherapy-related adverse events, and anemia management. Since development, the clinic has expanded into new roles and spread across the health-system based upon provider demands for expansion. Access to the health-system's electronic medical record allows for global care assessment of the patient through provider notes, labs pertinent to drug therapy, and specialty pharmacy information.

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The clinic also provides a learning opportunity for both first and second year pharmacy residents to further their clinical training. The data is maintained by data scientists at the Geisinger Cancer Institute. A physician survey was recently conducted to analyze the most beneficial aspects of the clinic seen by the oncologists and hematologists.

Results: As of June 2018, the clinic actively follows 1,080 patients throughout the health-system, completing approximately 1,671 encounters per month. When initially conceived, the clinic had one pharmacist full-time equivalent participating in the clinic. Since then, the clinic has expanded with three pharmacist full-time equivalents residing in the oral chemotherapy clinic, divided amongst the health-system's three sectors (west, central, and east). Patients and providers are utilizing all the various services provided by the program to provide the greatest benefit for the patient, with opportunities for expansion being developed for future health care needs. A survey of nine physician perceptions regarding the services of the oral chemotherapy clinic showed that the top three benefits were decreased physician visits/burden (8/9), increased patient support (8/9), and side effect management and monitoring (5/9).

Conclusion: At Geisinger, pharmacists are considered an integral resource in the management of patients on oral chemotherapy. Because of the clinical benefits witnessed by the physicians and impact on patient care, the program has continued to expand with additional pharmacist positions and expanded clinical services, allowing for greater impact on this patient population.

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Session-Board # - 7-073

Poster Title: Risk factors for febrile neutropenia among patients receiving preoperative or postoperative chemotherapy for breast cancer

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Febrile neutropenia (FN) can necessitate a reduction in chemotherapy intensity and/or prolong the treatment schedule, which highlights the importance of preventing FN. The prognosis of patients with breast cancer can be negatively affected by reductions in the intensity of preoperative or postoperative chemotherapy, and it is important to take steps to maintain the planned therapeutic intensity. FN can be prevented using prophylactic administration of antibiotic agents or granulocyte-colony stimulating factor (G-CSF). This study evaluated factors that were related to the development of FN among patients who received chemotherapy for breast cancer.

Methods: This retrospective study's protocol was approved by the ethics committee of Kochi University Medical School. Seventy six patients were included because they have received EC chemotherapy using epirubicin (100 mg/m²) plus cyclophosphamide (600 mg/m²) or TC chemotherapy using docetaxel (75 mg/m²) plus cyclophosphamide (600 mg/m²) as a preoperative or postoperative treatment for breast cancer at our hospital between April 2015 and March 2017. The patients' characteristics were retrospectively obtained, including whether they had received prophylactic antibiotic or G-CSF treatment. The development of FN was identified based on an axillary temperature of >37°C after the start of chemotherapy, according to the Japanese Society of Medical Oncology guidelines. The non-paired T test was used to compare the rates of FN development between the group that did not receive prophylactic treatment and the groups that received prophylactic antibiotic or G-CSF treatment. The Mann-

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Whitney and χ^2 tests were used to compare the baseline characteristics of the patients who did and did not develop FN. Risk factors were subsequently evaluated using logistic regression analysis. The patients were also grouped according to their breast cancer subtype (ER-positive and HER-2 positive, ER-positive and HER-2-negative, ER-negative and HER-2-positive, ER-negative and HER-2 negative) and the non-paired T test was used to compare their rates of developing FN.

Results: The time to FN onset was 10.1 ± 2.8 days after the initiation of chemotherapy. Relative to the group that did not receive prophylactic treatment (N=49), there was no significant difference in the rate of FN among patients who received antibiotic prophylaxis (N=11, $p=0.5$), although a significantly lower rate of FN was observed in the group that received G-CSF prophylaxis (N=16, $p=0.04$). Thus, patients who received G-CSF prophylaxis were excluded from the analysis to identify risk factors for developing FN. Sixty patients were included in the analysis of risk factors for developing FN, including 33 patients who developed FN and 27 patients who did not develop FN. There were no significant differences in the patients' background characteristics. However, significantly higher rates of FN development were observed for patients who were negative for ER and positive for HER-2. The logistic regression analysis further confirmed that non-expression of ER and expression of HER-2 were independent risk factors for the development of FN. The highest rate of FN development was observed in the subgroup of patients who were negative for ER and positive for HER-2.

Conclusion: In this study, we suggested that the risk factors of developing FN were ER-negative and HER-2-positive. The highest rate of FN development was observed in the subtype of ER-negative and HER-2-positive. These factors may be useful for identifying patients who will benefit from prophylactic G-CSF treatment.

2018 ASHP Midyear Clinical Meeting Professional Poster Abstracts

Session-Board # - 7-074

Poster Title: Health moves us towards treatment reconciliation for oncologic patients

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: To determine the incidence of clinically significant interactions among adult oncologic patients with their usual domiciliary therapies, as well as to describe the interactions between them and their oncologic therapies, classifying them according to their severity.

Methods: Prospective, descriptive, observational study carried out during a four-month period (from January to April 2018), which included all the patients who initiated an oncologic treatment in our hospital. The program Oncofarm® was used for the daily detection of new prescriptions, reconciling each patient's active domiciliary therapy prior to validation. With that purpose, we examined the electronic medical records in the primary care unit, checking for divergences between them and the therapies prescribed. We analyzed the existence of interactions via the Lexicomp® database, registering those classified as risk level C (monitor treatment), D (consider treatment modification) and X (avoid combination). The following variables were gathered: patient's demographic data (age and sex), diagnosis and oncologic treatment, therapeutic group, and number of domiciliary drugs and interaction risk level.

Results: During the study period, 263 patients initiated an oncologic treatment — 128 women (48.7%) and 135 men (51.3%), being their average age 63.4 years (range 29-85). 85.2% of patients received concomitant domiciliary therapy, with an average of 5.2 drugs per patient.

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213 patients (81%) presented pharmacological interactions. The total number of interactions was 961 — only 115 of them (12%) included oncologic drugs; the rest of them included domiciliary drugs. 6.6% of interactions (63) were type C, 1.6% (15 interactions) were type D, and 3.9% (37 interactions) were type X.

The most frequent type-C interaction (27 cases) involved proton pump inhibitors (PPIs) with certain antineoplastics, which implied a decrease in their therapeutic effect. Other frequent interactions with risk levels C and D involved the following therapeutic groups: antihypertensives (17 cases), antidepressants (12 cases), glucocorticoids (4 cases) and antiplatelets (2 cases). The most frequent type-X interaction involved metamizol and appeared in a total of 35 cases, producing myelosuppression as an adverse reaction.

Conclusion: Most of the patients who initiate antineoplastic therapy receive concomitant therapy for other conditions; therefore, reconciliation is essential to avoid clinically significant interactions.

The integration of the pharmacist into the different assistential levels would prevent inadequate prescriptions in primary care. Additionally, the integration in multidisciplinary teams contributes to the early detection of these potential interactions and minimizes the clinical impact they may have on these patients.

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Session-Board # - 7-075

Poster Title: Real-world efficacy and safety of osimertinib: a single institutional experience

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Osimertinib is a third-generation epidermal growth factor receptor tyrosine kinase inhibitor (EGFR-TKI). In Spain, it is approved for the treatment of patients with locally advanced or metastatic EGFR T790M mutation-positive non-small cell lung cancer (NSCLC).

We aim to analyze efficacy and safety of osimertinib in NSCLC patients treated at a tertiary care hospital.

Methods: We retrospectively reviewed all cases treated with osimertinib in our hospital from October 2016 to May 2018.

Demographics (age, sex), clinical characteristics (smoking history, disease classification (advanced or metastatic, histology, central nervous system (CNS) metastases presence), type of EGFR mutation, number of previous anticancer regimens for advanced disease, previous EGFR-TKI therapy), treatment (duration of treatment, type of response, date of progression, date of death) and toxicity variables were collected from medical records (Millennium-Cerner®), and from the electronic prescription software for antineoplastic drugs (Farmis-Oncofarm®). Variables used to evaluate efficacy were progression-free survival (PFS) and overall survival (OS), defined as time from first osimertinib dose to progression or death from any cause and time from first osimertinib dose to death from any cause, respectively. Moreover, overall response rate (ORR) was described. Adverse events (AE) were classified according to National Cancer Institute Common Terminology Criteria (version 5.0).

Patients treated with osimertinib in a clinical trial were excluded from the study.

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The collected data were analyzed by SPPSS Statistics® software version 23, the data analysis was performed using descriptive statistics and we used the Kaplan-Meier method for survival analysis.

Results: Up to the cut-off date (May 25, 2018) 11 patients (1 male) have received osimertinib. The median age was 63 years (range 49-80). Two patients were smokers, 6 ex-smokers and 3 never-smokers.

All cases were adenocarcinoma histology, 4 patients with CNS metastases at baseline. All patients had T790M-positive mutation. Seven had exon 19 deletion, 1 exon 21 L858R mutation and 1 both. The remaining two had negative EGFR mutation from a biopsy sample but T790M-positive mutation in plasma circulating tumor DNA.

Six patients received osimertinib as second line, the remaining as $\geq$ third-line. Nine patients had received previous EGFR-TKI therapy. The median duration of osimertinib treatment was 5months (range 0.5-19).

Response could be evaluated in 8 patients. ORR was 37.5% (3 partial response), with 4 stable disease.

At the time of data cut-off: 2 patients had died, 1 had discontinued treatment due to disease progression and 8 were on treatment. Median PFS was 12.6months (95% CI 2.1 to 23.1) and median OS not reached.

AE occurred in 7 patients, all were grade 1-2. The most commonly reported AE were diarrhea (4 patients), rash (4 patients) and asthenia (4 patients). No patient discontinued treatment due to AE or required dose reduction.

Conclusion: Osimertinib is well tolerated, with a good safety profile and without discontinuations due to AE. Therefore, it can be considered as a good therapeutic option in patients with advanced EGFR T790M mutation-positive NSCLC.

In clinical practice, the median duration of PFS was longer than the PFS described in the AURA3 study (10.1 months).

Osimertinib provide encouraging results for the targeted therapy of advanced EGFR T790M mutation-positive NSCLC with a good safety profile.

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Session-Board # - 7-076

Poster Title: Comparison of pegfilgrastim and filgrastim for the prophylactic effect for preventing febrile neutropenia in patients undergoing rituximab with etoposide, prednisolone, vincristine, cyclophosphamide and doxorubicin treatment

Poster Type: Evaluative Study

Submission Category: Oncology / Hematology

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Purpose: Dose-adjusted etoposide, prednisone, vincristine, cyclophosphamide and doxorubicin with rituximab (DA-EPOCH-R) regimen have been used for non-Hodgkin lymphoma (NHL) patients. In the DA-EPOCH-R regimen, granulocyte colony-stimulating factor (G-CSF) is recommended to use for preventing febrile neutropenia (FN) and individual patient dose adjustment. Recently, pegfilgrastim is used instead of daily G-CSF in the DA-EPOCH-R regimen. However, few cases have been reported about using pegfilgrastim for the primary prophylaxis of FN in DA-EPOCH-R and its efficacy has been poorly understood. In this study, we retrospectively compared the efficacy of pegfilgrastim with filgrastim in patients receiving DA-EPOCH-R.

Methods: Consecutive patients with aggressive NHL who received the DA-EPOCH-R regimen were screened from April 2013 to February 2017. The patients enrolled in this study fulfilled the following criteria: 1) received filgrastim or pegfilgrastim for the primary prophylaxis in the first cycle; 2) received DA-EPOCH-R regimen normal dose in the first cycle; 3) no fixed dosage with renal or hepatic function. We excluded patients who received filgrastim or pegfilgrastim with absolute neutrophil count (ANC) $<1000/\mu\text{L}$ in the first cycle. Patients were divided into two group according to the drug received, daily filgrastim (FG group) or pegfilgrastim (PEG group). In the first cycle, we checked the white blood cell (WBC) count, ANC, incidence of FN, duration of filgrastim use, hospital duration from start of chemotherapy and dose level at second cycle. The duration of filgrastim was defined as days filgrastim used for preventing FN, so days

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filgrastim used after incidence of FN were not included in the duration. In total cycles, we checked incidence of leukopenia (Grade 4), neutropenia (Grade 4) and FN, duration of filgrastim use, hospital duration from start chemotherapy and dose level change.

Results: Ten patients were recruited in this study. Clinical characteristics of 10 patients were not significantly different in the two groups. At the first cycle, the number of incidence of FN was the same between the two groups but the FG group tended to have lower WBC and ANC count in the nadir than the PEG group. Hospital duration from start of chemotherapy tended to shorter in PEG group than FG group except one patient. In total cycle analysis, 16 cycles from 5 patients in the FG group and 30 cycles from 5 patients in the PEG group were analyzed. The incident rate of FN in patients who received the DA-EPOCH-R regimen in our study was 10.8% (5 of 46 cycles). Though patient's characteristics were not different between the two groups, the incidence of severe neutropenia and FN were significantly reduced in PEG group in total cycles ($p < 0.05$). Hospital duration from start of chemotherapy in the PEG group was significantly shorter than that in the FG group. Though some patient decreased the dosage of chemotherapy in FG group, no patient decreased in PEG group.

Conclusion: Primary administration of G-CSF for preventing reduction of ANC and maintaining the chemotherapy dosage are very important in DA-EPOCH-R treatment. Our study showed that pegfilgrastim seems to be better than filgrastim for these points. Our study had several limitations; 1) our study population might not be representative of the general NHL patient because of a single medical center study; 2) dose adjustment after the first cycle was decided by the physician, and in some cases the dosage was not increased to upper limit. Thus, large-scale study is needed to validate our results.

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Session-Board # - 7-077

Poster Title: Improved palivizumab utilization for respiratory syncytial virus (RSV) prophylaxis pre- and post- implementation of a pharmacist clinical screening tool

Poster Type: Evaluative Study

Submission Category: Pediatrics

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Purpose: Evaluate palivizumab dosing, timing, and cost before and after implementation of pharmacy screening tool based on the American Academy of Pediatrics guidelines at Lakeland Regional Health Medical Center (LRHMC).

Methods: This is a single center, IRB approved, retrospective cohort study. This study was conducted completely at Lakeland Regional Health Medical Center (LRHMC) which is an 851-bed, tertiary referral hospital operating a Level II 15 bed Neonatal Intensive Care Unit. Inclusion criteria: Patients <18 years of age who were administered at least one dose of palivizumab during admission.

A complete list of patients who received palivizumab was obtained for the following RSV seasons: Pre-screening tool period: September 1, 2015, to April 30, 2016. Post-screening tool period: September 1, 2016, to April 30, 2017.

Retrospective chart review was performed to gather dosing and drug administration information as well as assess patient's medical history to confirm that eligibility criteria were met. A palivizumab clinical screening tool was created to evaluate patients with an order for palivizumab for appropriateness based on the 2014 AAP update. Moreover, the pharmacy department provided an education session to the pediatric prescribers at LRHMC regarding the 2014 American Academy of Pediatrics palivizumab guideline updates and the clinical screening tool.

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Pharmacy Standard Operating Procedure for reviewing palivizumab candidates was approved by Pharmacy and Therapeutics in July 2016 and implemented in August 2016.

Results: The number of patients that were reviewed decreased by 92% post the implementation of the pharmacy screening tool and education. This can be attributed to the decrease in patients being prescribed palivizumab after prescribers were informed of the new eligibility criteria when screening tools were implemented.

The total cost associated with palivizumab decreased by 92% leading to a difference of \$56,807.54.

Prior to screening tool implementation, only 19% of the total cost was spent on patients who met AAP guideline criteria while 81% was spent on patients who did not. After screening tool implementation, 67% of the total cost was spent on patients who met criteria while 33% was spent on patients who did not. Lastly, there was an increase in the percentage of patients receiving palivizumab > 48 hours prior to discharge increased post-screening tool implementation.

Conclusion: The implementation of utilization screening tools as well as providing pharmacy education to the prescribing pediatrician at LRHMC improved:
prescribing patterns, utilization, and reduced costs associated with palivizumab.

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Session-Board # - 7-078

Poster Title: Parental knowledge, attitudes and beliefs on fever: a cross-sectional study

Poster Type: Evaluative Study

Submission Category: Pediatrics

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Purpose: Fever is a common symptom of mostly benign illness in young children, yet concerning for parents. Research suggests that parents often misuse antipyretics by overdosing or underdosing, or by routinely alternating between antipyretics when managing a fever, despite guidance to the contrary. Studies examining parents' attitudes and beliefs around fever are limited. This study was conducted to describe parental knowledge, attitudes and beliefs regarding fever in children aged 5 years and less.

Methods: This cross-sectional study was approved by the institutional review board. Parents of children between 2 to 5 years of age were included. A previously validated questionnaire was sent via the participating schools to the parents. For a convenient sample, 7 primary schools in Beirut and Mount Lebanon areas were selected. The paper based questionnaire assessed the parents' demographics, and their knowledge, attitudes and beliefs regarding fever. The primary outcome measure was to assess parental knowledge about the precise definition of fever and causes, as well as the correct use of medications; and to evaluate the impact of years of parenting on this knowledge. The secondary outcome measure was to assess the parental sources of information, and the reasons to seek primary medical attention. Results were analyzed using descriptive and inferential statistics.

Results: A total of 734 parents contributed to this research. The majority of the respondents were mothers (90.7 percent) aged between 26 and 40 years (86.8 percent). They were mainly university (67.2 percent) or high school graduates (23.5 percent). For the primary outcome

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measure, almost half of parents (43.4 percent) recognized the true definition of fever i.e. a temperature above 38 Celsius or 100.4 Fahrenheit. On the other hand, half of parents declared that antibiotics are used to treat infections caused by viruses and that in case of fever there is an infection (43.5 and 56.1 percent respectively). Around half of parents usually take their child's temperature rectally with a thermometer (55.9 percent) and 26.1 percent in the ear with an ear thermometer. Moreover, 41.7 percent of parents were found to alternate between two fever-reducing medications when managing a child's fever. Multivariable analyses showed that parents' age (higher), educational level (higher), specialty (medical and paramedical), and first child age (higher) were significantly associated with a better knowledge on antibiotics and fever.

Conclusion: The study shows that parental knowledge regarding correct definition of febrile temperature is deficient. Parental experience with utilization of antipyretics and other medications during febrile illness was found to be generally good. The results of the study triggers community pharmacists to provide further support and additional resources to help parents when managing febrile illnesses, and assist all parents to provide optimal care for their children.

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Session-Board # - 7-079

Poster Title: Assessment of the cumulative AUC (cAUC) for busulfan (Bu) and donor-cell chimerism in the pediatric alloHCT population with non-malignant disorders

Poster Type: Evaluative Study

Submission Category: Pediatrics

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Purpose: Busulfan (Bu) is an alkylator routinely used in conditioning regimens before allogeneic hematopoietic stem cell transplantation (alloHCT) for various malignant and non-malignant disorders (e.g., immunodeficiencies, inherited metabolic diseases, and hemoglobinopathies). The optimal goal for Bu cAUC exposure remains unclear for non-malignant disease. The aim of this study was to determine the optimal Bu cAUC in the pediatric alloHCT population with non-malignant disorders by using donor-cell chimerism as a clinical biomarker of successful engraftment.

Methods: In this retrospective analysis, we included patients (n=71) with non-malignant disorders who underwent alloHCT with intravenous Bu as part of their conditioning regimen at UCSF Benioff Children Hospital, San Francisco, Ca. Diagnoses included severe combined immunodeficiency (SCID; n=16), non-SCID primary immunodeficiency (n=26), bone marrow failure (n=4), hemoglobinopathies (n=15) and inherited metabolic disease (n=10). We included patients with secondary graft failure (i.e. failure of Bu therapy) based on pre-specified criteria (<50% myeloid chimerism at either 1 or 3 years and a return of original disease symptoms or repeat conditioned transplant). Patients with primary graft failure were excluded (PGF; i.e. failure of immunoablation) based on pre-specified criteria (<20% whole blood chimerism at 1 month and with either repeat conditioned transplant within 3 months of original transplant or death from aplasia or its complications e.g. infections, bleeding). Donor-cell chimerism (%donor CD3, CD14/15, CD19 cells) at 1, 3, and 36 months post-alloHCT was the main outcome of

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interest. cAUC was estimated using non-linear mixed effects modeling (NONMEM). Data are expressed as Bu cAUC median with range, and evaluation of donor-cell chimerism by either student t-test and/or analysis of variance (ANOVA).

Results: The CD14/15 cell-type percent donor-chimerism was assessed as a categorical variable split into three groups (% CD14/15 <20% or last recorded, % CD14/15 >90% or last recorded and % CD14/15 between 20%-90% or last recorded). The median (range) of Bu cAUC for all non-malignant patients (excluding patients with PGF) was 68 mg·hr/L (24-107). The median (range) of Bu cAUC for patients with CD14/15 chimerism <20% (or last recorded) was 36 mg·hr/L (24-68). Finally, the median (range) of Bu cAUC for patients with CD14/15 chimerism >90% (or last recorded) was 68.9 mg·hr/L (3.6-107.6)

Conclusion: The results of this retrospective study suggest that targeting Bu cAUC to 70 mg·hr/L is sufficient for achievement of donor-cell engraftment in pediatric alloHCT patients with non-malignant disorders. Prospective clinical studies are needed to assess the clinical validity and utility of these results.

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Session-Board # - 7-080

Poster Title: Comparison of posaconazole suspension and delayed release tablets in pediatric hematology/oncology patients

Poster Type: Evaluative Study

Submission Category: Pediatrics

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Purpose: Posaconazole has proven effective in preventing invasive fungal infections in neutropenic pediatric patients. The oral suspension formulation has significant challenges in administration and absorption; these are theorized to be decreased or eliminated with use of the delayed release tablets. However, this has not been validated in the pediatric population. This study was conducted to compare the efficacy and safety of the posaconazole suspension and delayed release tablets in pediatric hematology/oncology patients.

Methods: An institutional board approved, retrospective chart review in pediatric hematology/oncology patients was conducted from February 2013 to February 2017. Patient demographic data was collected, as well as data on posaconazole formulation, dose, levels, and adverse events. Concurrent acid suppression and antiemetic medications were noted, as well as fungal culture results. Posaconazole levels were considered therapeutic if greater than or equal to 700 ng/mL. Statistical tests were conducted and include independent samples t tests, logistic regression analyses, and chi-square tests. When appropriate, the alpha significance level was set at 0.05.

The primary objective of the study was to compare the efficacy of posaconazole suspension and delayed release tablets in attaining desired posaconazole levels and preventing fungal infections. The secondary objective of the study was to compare the safety profile of posaconazole suspension and delayed release tablets.

Results: One hundred patients with 605 posaconazole levels were screened for eligibility. Sixty five patients with 353 posaconazole levels were included. 51.6% of levels drawn while patients

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were receiving posaconazole suspension were therapeutic, compared with 62.5% of levels drawn while patients were receiving delayed release tablets ($p = 0.035$). Levels drawn while taking the suspension and concomitant acid suppression (histamine receptor antagonists or proton pump inhibitors) were significantly less likely to be therapeutic compared to those drawn while taking delayed release tablets with concomitant acid suppression ($p < 0.0001$). Thirty one patients (48%) had an alternative antifungal initiated during their course of therapy. The mean posaconazole level prior to initiation of the alternative antifungal was 708 ng/mL, though the most recent posaconazole level in these patients was therapeutic in only 11 of the 31 (35%). Of the patients with an alternative antifungal medication added, only one had a positive fungal microbiology result, and this patient's prior posaconazole level was not therapeutic.

Frequency of nausea and vomiting were similar between patients taking the suspension and delayed release tablets ($p = 0.375$ and $p = 0.469$). Patients receiving both formulations had increases in transaminases from baseline and the difference was not statistically significant.

Conclusion: Delayed release tablets proved more effective in achieving therapeutic posaconazole levels, with minimal difference in adverse events, as compared with posaconazole suspension, in pediatric hematology/oncology patients. No statistically significant difference in adverse events between formulations was found. Further study is warranted to validate these results.

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Session-Board # - 7-081

Poster Title: Amikacin pharmacokinetics in geriatric patients treated large dose extended interval(LDEI) and recommendation of initial dosage regimen

Poster Type: Evaluative Study

Submission Category: Pharmacokinetics

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Purpose: In geriatric patients, amikacin has been widely used in the treatment of serious infections caused by gram-negative bacteria. The population pharmacokinetics and dosage regimen available for this age group are limited. This study was aimed at 1) analyzing the geriatric population pharmacokinetics of large-dose, extended-interval dosing of amikacin (10–20 mg/kg/dose every 24, 36, or 48 h), 2) evaluating the correlations between patient characteristics (the age and creatinine clearance) and amikacin pharmacokinetics, and 3) proposing the dosage regimen for geriatric patients.

Methods: We conducted a single-center retrospective study. It included patients (age≥65 years) admitted to the Asan Medical Center (2704 beds), a tertiary hospital in Seoul, Korea from 2014 to 2017 when amikacin was administered as per the LDEI regimen. Exclusion criteria were burns, the use of intermittent hemodialysis, peritoneal dialysis, and continuous renal replacement therapy at the beginning of amikacin therapy. We collected clinical and demographic data. We calculated the volume of distribution (Vd) and clearance (CL) using the standard equation. We divided the study population into two groups according to the age (65–75 years, n=43; >75 years, n=17) and compared the mean of the Vd and CL of amikacin. We also divided the study group into two groups based on creatinine clearance (CrCL) [CrCL=30–60 mL/min (n=15) and CrCL>60 mL/min (n=45)] and compared the mean Vd and CL of amikacin. Student's t-test was used to compare the mean Vd and CL of amikacin. We calculated initial dose and interval using the following equations:

$\text{Dose} = C_p \times t_{inf} \times V_d \times k_e \times (1 - e^{-k_e \times \tau}) / (1 - e^{-k_e \times t_{inf}})$ and

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Dosing interval= $t_{inf} + [\ln(C_p/C_t)/k_e]$,

where C_p = concentration after 1 h of starting the infusion, C_t =concentration within 30 min of starting the next dose, t_{inf} =time of infusion, k_e =elimination constant, and τ =dosing interval.

Results: The analysis included 120 amikacin plasma concentrations (peak and trough pairs) from 60 patients (men: 43, women: 17, mean age, 72.9 ± 5.3 years, age range: 65–87 years). Patients received an amikacin dose of 14.2 ± 2.1 mg/kg once daily (including 48 h dosing one patient). The mean concentrations of the peak and the trough were 33.8 ± 7.2 mg/L and 2.1 ± 2.5 mg/L, respectively. The pharmacokinetic (PK) parameters of amikacin in the study population were as follows: V_d (0.455 ± 0.115 L/kg) and CL (0.065 ± 0.025 L/kg/h). The PK parameters of amikacin for the subgroups were as follows: V_d [0.45 ± 0.11 L/kg (65–75 years) vs. 0.47 ± 0.13 L/kg (over 75 years) $p=0.586$], CL [0.067 ± 0.023 L/kg/h (65–75 years) vs. 0.060 ± 0.028 L/kg/h (over 75 years) $p=0.421$], V_d [0.42 ± 0.12 L/kg ($CrCL=30-60$ mL/min) vs. 0.46 ± 0.11 L/kg ($CrCL>60$ mL/min) $p=0.294$], and CL [0.060 ± 0.024 L/kg/h ($CrCL=30-60$ mL/min) vs. 0.067 ± 0.024 L/kg/h ($CrCL>60$ mL/min) $p=0.397$]. The calculated dose and interval were 20.6 mg/kg and 21.8 h (target peak: 45 mg/L; target trough: 2 mg/L), respectively, when the V_d was 0.455 L/kg and k_e was 0.146 h^{-1} .

Conclusion: In our study, the V_d of amikacin in geriatric patients was higher than in adults. The CL of amikacin in geriatric patients was lower than in adults. The Age and $CrCL$ were not correlated with the V_d and CL of amikacin in the study group ($CrCL \geq 30$). The number of the patients in our study with the $CrCL$ of 30–60 mL/min was probably insufficient to be representative; thus, the pharmacokinetic parameters in geriatric patients need to be analyzed with sufficient study population. We recommend an amikacin initial dose of 20 mg/kg once daily in the elderly with normal renal function.

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Session-Board # - 7-082

Poster Title: Effect of age on the pharmacokinetic profile of subcutaneous C1-esterase inhibitor in the treatment of hereditary angioedema

Poster Type: Evaluative Study

Submission Category: Pharmacokinetics

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Purpose: Hereditary angioedema (HAE) due to deficiency of C1-esterase inhibitor (C1-INH) is characterized by recurrent, disabling attacks of edema. Subcutaneous C1-INH (C1-INH [SC] 60 IU/kg, HAEGARDA[®], CSL Behring) is indicated for routine prophylaxis to prevent HAE attacks in adolescents and adults. A population-based exposure-response analysis demonstrated an inverse relationship between predicted C1-INH functional activity at the time of an attack and the relative risk of an attack. This post-hoc analysis evaluated the pharmacokinetic (PK) profile of C1-INH (SC) in adolescent, adult, and elderly patients with HAE to determine the effects of age, if any, on C1-INH functional activity.

Methods: The COMPACT trial was a randomized, multicenter, double-blind, placebo-controlled, crossover study in which patients with HAE (age ≥ 12 years) self-administered C1-INH (SC) and corresponding placebo twice weekly in a double-blind, crossover manner over 2 consecutive 16-week treatment periods. Blood samples were drawn for assessment of C1-INH functional activity at screening; at day 1 of week 1; at weeks 3, 5, 8, 11, and 14 of each treatment period; and at the end-of-study visit. Observed C1-INH functional activity was plotted against time and stratified by age group (12 to <17 years, 17 to <65 years, and ≥ 65 years). In addition, PK parameters derived from a population PK analysis of the COMPACT study were evaluated.

Results: During weeks 3 through 14 of the active treatment period, mean C1-INH functional activity observed during administration of C1-INH (SC) 60 IU/kg twice weekly ranged from 55.4% to 65.7% in adolescent patients (n=3), 62.5% to 69.3% in patients 17 to <65 years (n=39),

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and from 59.5% to 77.1% in patients 65 years and older (n=3). After administration of C1-INH (SC) 40 IU/kg twice weekly, mean C1-INH functional activity ranged from 42.8% to 47.6% in adolescent patients (n=3), 45.5% to 50.9% in patients 17 to <65 years (n=38), and 35.6% to 46.7% in patients 65 years and older (n=4). With C1-INH (SC) administered at the approved 60 IU/kg dose, mean C1-INH functional activity was maintained at similar levels, regardless of age. Population PK analysis in patients with HAE showed that within the age range analyzed (12-72 years), age did not have a clinically relevant effect on the PK of C1-INH functional activity after SC administration.

Conclusion: In this post-hoc analysis, there were no age-related effects on the PK of C1-INH functional activity in patients with HAE treated with C1-INH (SC). The results of this analysis support the use of the same weight-based dose in adolescent, adult, and elderly patients.

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Session-Board # - 7-083

Poster Title: Pharmacokinetics of synthetic cathinones found in 'bath salts' in mouse brain and plasma using liquid chromatography-mass spectrometry

Poster Type: Evaluative Study

Submission Category: Pharmacokinetics

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Purpose: Recent studies indicate that two common synthetic cathinones or "bath salts," 3,4-methylenedioxypyrovalerone (MDPV) and 3,4-methylenedioxymethcathinone (methylone), have similar pharmacology to controlled psychostimulants. MDPV is a norepinephrine (NE) and dopamine (DA) reuptake inhibitor, blocking their transporters (DAT and NET), whereas methylone is a substrate at the NE, DA, and serotonin (5-HT) transporters, increasing the non-vesicular release of these monoamines. Increases in DA are associated with euphoric effects that promote drug misuse and account for the high addiction potential of MDPV and methylone. The purpose of this study is to determine the pharmacokinetic profiles of these drugs in plasma and brain.

Methods: The pharmacokinetics of MDPV and methylone in the brain and plasma were examined following intraperitoneal injection in mice. These types of injections have similar pharmacokinetics to insufflation (snorting), which is the manner in which MDPV and methylone are commonly misused. Briefly, adolescent male Swiss-Webster mice were injected intraperitoneally with either 10 mg/kg MDPV or 10 mg/kg methylone, and brains and plasma were collected at the following time points: 1, 10, 15, 30, 60, and 120 minutes. Samples were then flash-frozen and stored at negative 70 degrees Celsius until analysis. Samples were spiked with deuterium-labeled MDPV or methylone (internal standards), and the drugs were extracted from tissue using a previously published solid phase extraction method. Chromatographic separation of the compounds was achieved using a HILIC column with a gradient elution of

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acetonitrile and 5 mM ammonium formate at a flow rate of 0.2 mL/min. Mass spectrometric detection utilized a Shimadzu IT-TOF system with the electrospray source running in positive mode. Data acquisition utilized a direct MS-MS method using a precursor ion of 276.3 m/z for MDPV and methylene. The calibration curve ranged from 100 ng/mL to 0.1 ng/mL. These conditions allowed for a lower limit of detection (LLOD) of less than or equal to 1 ng/mL and a lower limit of quantification (LLOQ) of less than or equal to 5 ng/mL for MDPV and methylene.

Results: Following intraperitoneal administration, both drugs quickly crossed the blood-brain barrier and entered the brain. The time to maximal concentration (T_{max}) for methylene in plasma was 10 minutes, and peak brain concentrations of methylene were achieved shortly after plasma, at 15 minutes. The T_{max} for MDPV was at 10 minutes in both plasma and brain. Additionally, MDPV trended towards higher concentrations in the brain than methylene, consistent with MDPV's higher lipophilicity (logP value), although the C_{max} in brain was not significantly different between the two drugs. However, total exposure to MDPV (as represented by AUC) was higher in both plasma and brain, as compared to methylene. With regards to drug elimination, both methylene and MDPV have short half-lives in plasma or brain. The half-life of MDPV in brain was 15.6 minutes and 18.6 minutes in plasma. The half-life of methylene was greater than MDPV, with values of 30.3 minutes in brain and 21.0 minutes in plasma.

Conclusion: In conclusion, the pharmacokinetics of these drugs reflect a quick uptake and distribution of the drugs into the brain, followed by the quick distribution out of the brain, which likely contributes to the binge use of these drugs.

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Session-Board # - 7-084

Poster Title: A quantitative study on usage and effect of thrombolytic agent in MI patients at tertiary care hospital

Poster Type: Evaluative Study

Submission Category: Pharmacokinetics

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Purpose: The thrombolytic agent is one of the treatment approaches to manage diseases such as acute myocardial infarction, stroke, and heart attack. While the acute myocardial infarction (MI) is a major cause of morbidity and mortality among Indian population, this study is performed to (1) determine the possible factors associated with effect of thrombolytic drug on myocardial infarction (MI), (2) compare the practical pattern of thrombolytic agents in MI patients, (3) identify the ADR associated with the thrombolytic agent post-treatment, (4) determine the overall effectiveness of the thrombolytic treatment , and (5) evaluate the thrombolytic therapy with standard guideline.

Methods: It is a quantitative study conducted in Bangalore Baptist Hospital for six months among 200 inpatients diagnosed with MI and received thrombolytic agent. The admitted cases were selected for the study on effect of the thrombolytic agent in MI patients. Moreover, the cases' charts were reviewed for potential drug interactions; the drugs involved in interactions (dose, route, frequency, therapy duration, and indication), the laboratory investigations, the followed up, the drug-related problems of the thrombolytic agent and the pharmacist's intervention were the source of study. Alternately, the prescription audit as an important component of clinical pharmacy was applied to evaluate the status of prescriptions in order to optimize the medication use, minimize the number of medication-related problems, and improve the medication therapy. Further, the literature reviews and the clinical pharmacist's intervention were applied in this study. The comparison between the treatment procedure and guideline was done for better understanding of the link between the ADRs, Morbidity and mortality ratios. The severities of the drug interactions were assessed and categorized as major (can cause permanent damage or life risk), moderate (can cause harm and treatment are required) or minor (can cause small or no clinical effect, with no treatment required). As an

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ethical consideration, the patients' records were stored confidentially, and for further analysis, the Excel was used. The findings were categorized based on the pharmacodynamics mechanism.

Results: The study showed the maximum number of patient between ages 41 to 60 were receiving thrombolytic medication, with a diagnosis of AMI. 46% cases had streptokinase injection, 75% patients had dysrhythmia, and 25% had bleeding. Common dysrhythmia was 78.2% premature ventricular contraction. 46% of patients had slow ventricular tachycardia, 16% had a premature atrial contraction, and 4% had other arrhythmias. The means were CPK 604, LDH 565.4, CKMB 58.2, and CTNI 8.7. In auditing the prescription errors, 30.4% contains inappropriate abbreviation, 28.4% prescription contains drugs without generic name, 13.7% prescription not legible, 7.8% variation in dose, 6.9% frequency not mentioned, 5.9% rout not mentioned, 2.9% without signature or name of physician, 2% not in capital letter, and 2% mislabeling. There was no pharmacokinetic interaction in which synergism 81.75% and antagonism 18.6% type of interaction. During treatment, 25% of men died due to intracranial bleeding and 34% female died due to GI bleeding. The patients with previous myocardial infarction had a higher long-term mortality rate with streptokinase (34.9 versus 21.5% with placebo, $p = 0.03$). At six months, there were significantly more cases of reinfection in the streptokinase group (7.2 versus 4.5%, $p = 0.02$).

Conclusion: The outcome showed that majority of thrombolytic was prescribing to a male patient. It was concluded that Alteplase and Reteplase were highly prescribed the thrombolytic drug and the majority of a patient receiving thrombolytic have stayed more than eight days in the hospital. It was found that majority of prescription include no generic name with inappropriate abbreviations. On the other hand, there was a very high incidence of interaction between thrombolytic and other drugs and the most drugs interacting with thrombolytic were Aspirin, Heparin, and Enoxaparin. Also, the chance of morbidity during treatment was high while mortality was low.

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Session-Board # - 7-085

Poster Title: Impact of a multi-step action plan to enhance the medication error reduction plan in a critical access hospital in California

Poster Type: Descriptive Report

Submission Category: Pharmacy Law / Regulatory / Accreditation

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Purpose: To combat medication errors, California enacted the Health and Safety Code (HSC) section 1339.63 on January 1, 2004 requiring a Medication Error Reduction Plan (MERP) for hospital re-licensure. This HSC section outlines standards and reportable data requirements; including a comprehensive annual review demonstrating data collection, analysis, and resultant MERP activities. After initial implementation over 10 years ago, many critical access hospitals have struggled with maintaining a compliant, interdisciplinary MERP. Recognizing opportunities in the MERP at this critical access hospital, investigators sought to assess the impact of a comprehensive assessment tool for attaining and maintaining MERP compliance.

Methods: This was a single site survey assessing compliance with the 7 MERP requirements before (March 2017) and after (October 2017) implementation using a multi-step assessment tool. The assessment tool included a compliance checklist and action plan that was based on the published "Licensing and Certification Program General Acute Care Hospital Relicensing Survey Pharmacy Entrance List: Entrance Documents/Data Request for MERP and Pharmaceutical Services." The assessment tool was used for coordination of the action plan initiatives and creation of an index for a "survey ready" binder in which requested compliance documents and instructions for producing required data were compiled. Initial compliance was assessed using the tool in March 2017 and then reviewed monthly at regular interdisciplinary meetings. Compliance within the survey was categorized as compliant, incomplete compliance, or noncompliant. Incomplete compliance indicated that the element was present; however, review and revision were required.

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Results: Overall, a 507% increase in compliance with the California MERP elements was observed post-implementation of the assessment tool. Initial assessment of the hospital plan regarding the 7 elements found 14% (1/7) in compliance, 43% (3/7) noncompliant, and 43% (3/7) incomplete compliance. Post-implementation, 85% (6/7) of the elements were deemed in full compliance with 15% (1/7) incomplete compliance and requiring additional review and revision. Additionally, in October 2017, the resultant effects of action plans produced rendered a successful re-licensing survey with no corrective actions or findings for MERP compliance.

Conclusion: The use of a multi-step assessment tool and action plan led to a substantial increase in MERP compliance at a critical access hospital in California yielding re-licensure.

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Session-Board # - 7-086

Poster Title: Lessons learned in USP 797 and 800 upgrades in a rural Connecticut hospital

Poster Type: Descriptive Report

Submission Category: Pharmacy Law / Regulatory / Accreditation

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Purpose: The United States Pharmacopeia (USP) Chapter <797> outlines requirements for sterile compounding of pharmaceuticals including responsibilities and training of compounding personnel, facilities, environmental standards and monitoring, and final preparation storage and testing. While the chapter itself is not a legal document, the federal government through such departments as the Centers for Medicare and Medicaid Services and Food and Drug Administration as well as many states has established that USP Chapter <797> is enforceable. A new chapter, USP Chapter <800>, will be enforceable starting December 1, 2019 was developed focusing on the safety of employees while compounding hazardous drugs.

Methods: Sharon Hospital is a rural, 78-bed hospital in Connecticut, a state with laws enforcing USP Chapter <797>. To attain compliance with USP Chapter <797> and to be prepared for USP Chapter <800> compliance a plan was developed which included designing and building a new sterile compounding suite. During the process staff turnover including management across the hospital caused a lack of continuity within the processes. Following the initial cleanroom construction and process updates, a new Director of Pharmacy was hired. During a state Department of Public Health survey, many fallouts in the new process were identified. The new director was tasked with working together with a multidisciplinary team to develop action plans to correct the fallout issues. Throughout the process all involved learned many valuable lessons.

Results: The fallouts identified were directly related to a lack of knowledge regarding the state regulations and the requirements of USP Chapter <797>. Several actions were taken in order to be in compliance with the requirements and regulations. First, procedures were created or updated outlining specific steps for each requirement. Also, the contractors that were used for the original build out were asked to make modifications based on the new processes. An important learning opportunity was more due diligence and vetting of the contractors

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knowledge of and ability to properly build a compliant sterile compounding suite would have prevented many of the identified issues. Finally, both written and hands on competencies for the standards within USP Chapter <797> and the new pharmacy processes were developed and required to be completed by all employees of the pharmacy. In the end, after almost 2 and ½ years, the sterile compounding suite was officially deemed compliant by the State of Connecticut.

Conclusion: While this process was an exceedingly trying time period for this small, rural hospital in Connecticut, in the end the individuals involved learned many valuable lessons related to process improvement, the requirements of USP Chapter <797> and state regulations, and working together as a multidisciplinary team. Other facilities going through this process should create a detailed plan with special attention to the requirements and state-specific regulations, including contingency plans for unexpected or unplanned setbacks.

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Session-Board # - 7-087

Poster Title: Student pharmacists knowledge of adverse event reporting and its place in the curriculum

Poster Type: Descriptive Report

Submission Category: Pharmacy Law / Regulatory / Accreditation

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Purpose: Often pharmacists are viewed as the most accessible health care professional. The ever-evolving pharmacist-patient dynamic allows pharmacists to witness and/or become aware of patient adverse events. Consequently, this awareness comes with the responsibility to report adverse events. Currently, the Accreditation Council for Pharmacy Education (ACPE) does not include adverse event reporting as a curricular requirement. Therefore, there is a possibility student pharmacists and pharmacists alike are unaware of adverse event reporting. This study was designed to better understand knowledge and beliefs student pharmacists have regarding the importance of and process surrounding adverse event reporting, and the impact of pharmaceutical companies.

Methods: This prospective study, which was approved by the Institutional Review Board, included student pharmacists at all levels of their degree program irrespective of their background knowledge or experience. Students were recruited through their respective universities and via local Industry Pharmacist Organization chapters. Additionally, this survey was sent to pharmacy Deans at various pharmacy schools to distribute among their students. Students, who provided informed consent, were asked to complete a voluntary survey which remained open for 13 weeks. The survey included twenty-one total questions which were reviewed by faculty members at the University. The first four questions collected demographic information regarding the student and their experience. Additionally, we aimed to identify the point in the curriculum where students were exposed to adverse event reporting, if at all. The next twelve questions, structured using a five-point likert scale, assessed the student's knowledge and opinions. The investigators felt that it was important to understand baseline

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knowledge students possessed regarding the adverse event reporting process, as well as their comfort level reporting adverse events. Furthermore, questions were included to solicit opinions regarding the necessity for adverse event reporting to be included in the PharmD curriculum, as well as the pharmaceutical industry's role in medication safety. The remaining questions, which were included as a knowledge check, represented a minimum standard necessary to sufficiently report adverse events in the real-world setting.

Results: Two hundred and twenty-seven students from 22 schools of pharmacy participated in our assessment. Three students were excluded for a lack of consent. Of the 224 student participants included in the analysis, 46.8% agreed or strongly agreed that their pharmacy school curriculum prepared them to report adverse events while 36.3% felt confident enough (agreed or strongly agreed) to walk a patient through the reporting process. The knowledge check revealed that only 14.5% of participants knew where they could submit an adverse event. Over 95% of students agreed or strongly agreed that adverse event reporting is an important aspect of medication safety, but 25% felt that pharmaceutical companies still prioritize profits over patient safety.

Conclusion: Adverse event reporting should be included within ACPE curriculum requirements for schools of pharmacy. Results from this study indicate that student pharmacists feel it should be part of the curriculum, but may not have the confidence or knowledge to accurately report an event. Despite the understanding that adverse event reporting is an important aspect of patient safety, the belief still exists that pharmaceutical companies are more focused on profits than patients.

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Session-Board # - 7-088

Poster Title: Evaluation of objective structured clinical examination (OSCE) in faculty of pharmacy at King Abdulaziz University (KAU)

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Objective structured clinical examination OSCE has been used all over the world in many medical schools as a valid assessment tool for students' clinical competencies. The faculty of pharmacy at King Abdulaziz University was established in 2001, and OSCE was implemented in 2015 as an additional assessment tool. The purpose of this study is to assess students' evaluation of OSCE as a tool to improve pharmacy students' learning outcomes and to evaluate the students' acceptance of this new method of evaluation.

Methods: A survey questionnaire was conducted to assess the students' evaluation of the OSCE exam through the academic year 2017/2018. Students in 4th and 5th year were examined OSCE individually through six different stations with assigned scenarios for each station based on the course syllabus that they studied throughout the semester, same scenarios for all students in each year. However, not all scenarios are pharmacist/doctor scenarios; some are pharmacist/patient scenarios. The exam took place in a well-equipped clinical skill and simulation center at KAU hospital. Then, the paper-based questionnaires were distributed after one week of the OSCE exam. The survey questions were subcategorized based on each station's topic. Questions were asked about the easiness of understanding the exam written instructions, level of difficulty, the degree of learning gained, and adequacy of time given.

Results: A total of 163 fourth year and fifth-year pharmacy students were involved in the survey. Among them, 91% of them agreed that implementing OSCE in the curriculum is beneficial for them. Of the fifth year class, However, 72% of the students felt that it was

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exhausted. 44.79% of 5th year's students thought the exam was easy/lean toward "Neutral and Easy/Easy to Neutral" when evaluating the level of difficulty,, while 43.72% of the fourth 4th year's students thought the exam was neutral/lean toward "Neutral and to Difficult". 92% of 4th year and 72% of 5th year agreed that orientation is needed prior to the exam. The majority of the fourth and fifth year. More than 44% of all students thought the learning gained from the exam was neutral to high/students lean toward "Neutral to High" need for learning and orientation prior the exam, 81%, and 78% respectively. Also, they lean toward "Neutral to Enough" adequacy of the exam time, 65.66%, and 83.82%, respectively.

Conclusion: Pharmacy students require more learning and orientation prior to the OSCE exam and training for time management. This survey required a post-investigation after implementation of an intervention tool of orientation.

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Session-Board # - 7-089

Poster Title: Creation of a unique non-patient care rotation for a resident on light duty

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: A resident returned from a brief medical leave requiring a period of light duty during the final weeks of residency training. Having completed all patient care requirements, we were tasked with creating a novel rotation to complete the training program. A rotation was designed to meet the needs of the resident and to further enhance clinical pharmacy services at the institution.

Methods: Prior to the resident returning from leave, the residency program director and director of pharmacy created a list of projects important to the residency and pharmacy departments. The program director met with the resident after the period of medical leave to assess the resident's interests and remaining graduation requirements. A new learning experience titled Clinical Advancement was created. The purpose of the rotation was to improve clinical practices through the creation of various projects to improve efficiency and patient care. Additionally, the resident participated in the residency improvement process by completing various projects to advance the program. This also exposed the resident to the requirements to establish a residency program and a learning experience. The resident was given example learning experience descriptions and was coached by the program director when selecting objectives and creating activity statements. The resident was tasked with organizing onboarding and scheduling for the upcoming residency year. Activities included creating the orientation calendar, presentation schedule and room reservations, rotation schedule, resident time tracking tools, developing a graduation requirements tracking tool and updating the residency policies and handbook. The resident completed a transitions of care project which addressed an area of partial compliance during a recent accreditation survey. The resident also

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designed and implemented a process to increase resident involvement with students rotating at the site.

Results: The learning experience offered the resident unique perspective on the design and development of a rotation and residency program improvement. The resident was able to spend additional rotation time focusing on objectives in competency areas 2 and 3. In-depth understanding of the ASHP residency standards and required competency areas, goals and objectives was gained. There was overlap between the current and oncoming residents by a few weeks which was mutually beneficial. The resident was instrumental in organizing orientation and explaining many institutional and program processes. A new process for pharmacist to pharmacist handoff was created and implemented to meet ASHP accreditation standards. Another new process to increase resident involvement with students was created. Residents assisted in precepting 17 students in the subsequent year. Quality of the student rotation increased as evidenced by an improvement in post-rotation evaluation scores related to orientation, communication and clarity of expectations. At the conclusion of the rotation the resident was prepared to create and conduct learning experiences for residents and students. Additionally, the resident gained further understanding related to developing clinical services.

Conclusion: The resident was able to successfully meet graduation requirements and prevent further delays in completing the program with the development of a mutually beneficial non-patient care learning experience.

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Session-Board # - 7-090

Poster Title: Development and implementation of a staffing checklist for PGY1 residents and pharmacy staff in discordant rotation schedules

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Preparation and distribution services remain vital functions of pharmacy departments in community hospitals. The purpose of our PGY1 program is for residents to become clinical generalists in a multi-specialty community hospital with a wide variety of services. Based upon resident feedback and to match programs in our market, the weekend staffing requirement was decreased and no longer aligned with the clinical pharmacist rotation. Additionally, residents are expected to achieve staffing competency by December. Objective measurements for service commitment were created to ensure competency and track progress while maintaining a single preceptor.

Methods: A primary preceptor for service commitment was identified as willing and able to provide a strong learning experience. Residents staff every third weekend and one evening per week. Clinical pharmacists staff one evening per week and every fourth weekend. The resident's assigned evening rotates on a weekly basis so as to best align with the preceptor's schedule. Objective staffing measurements were created to maintain quality feedback with decreased staffing overlap. Criteria was used to develop a staffing checklist for residents and clinical pharmacists to complete at the end of each shift. Criteria on the checklist includes: order verification, product check, kinetics and clinical reports, narcotic dispensing, answering phone calls, response to medication messages, code response and TPN preparation. The resident self-assesses at the end of each shift listing what went well, what could have been improved upon and what was done to maintain workflow. The resident also lists issues that

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arose during the shift that took a significant amount of time to resolve. Clinical pharmacists have a similar checklist to provide written feedback after the shift. The preceptor uses the checklists to provide formative feedback during the evening shift worked with the resident.

Results: There were no barriers to implementation. Use of the checklist was well received by clinical pharmacists. The checklist engaged non-preceptors and provided a method to solicit input on resident progress. The preceptor was able to provide formative feedback and used input to complete summative assessments. Areas of deficiency were addressed prior to instead of during the summative assessment. Areas addressed as formative feedback were code response and self-assessment. The neurology rotation was modified to increase code stroke participation. Residents were given a pager for immediate notification and rotated response weekly during working hours. An additional crash cart review was provided and the rotation schedule was modified to address inadequate response to code blues. The residency program director met with residents to address incomplete checklists which improved quality of resident self-assessment across all evaluations.

Conclusion: Implementation of a checklist allowed the program to utilize a single staffing preceptor and improved the quality and frequency of feedback provided to residents. Residents met staffing expectations earlier in the course of the program. Objective criteria gave preceptors confidence that staffing competency was achieved by December.

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Session-Board # - 7-091

Poster Title: Utilization of a pharmacy resident driven newsletter to provide education for healthcare providers

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Healthcare providers need to maintain clinical competency and remain knowledgeable to provide optimal patient care services. An educational newsletter can provide clinical knowledge for practitioners to help advance their respective practices. The purpose of this study was to capture the demographics and insights of healthcare providers regarding a pharmacy resident constructed educational newsletter.

Methods: A 21-item, cross-sectional, single-centered, electronic survey was distributed via e-mail to healthcare practitioners at a 1423 bed community health-system in Southwest Florida. Four post-graduate year-2 (PGY2) pharmacy residents contributed to the newsletter weekly, alternating between three topics: infectious diseases, critical care, and pediatrics. Pharmacists, physicians, and advanced healthcare practitioners receiving the pharmacy resident produced newsletter were eligible to respond to the survey. Data related to the respondents' demographic information, experience, qualifications, perceived knowledge and importance of the newsletter in providing medical education were collected. Practitioners' insights related to the newsletter content were captured via a 5-point Likert scale (1=strongly disagree; 5=strongly agree). Reminders to participate in the survey were embedded in the newsletter and sent weekly from March to May of 2018. This study was approved by the Institutional Review Committee.

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Results: Of the 28 responses received, 12 (42.9%) were pharmacists, 7 (25%) were physicians, 5 (17.9%) were nurse practitioners and 4 (14.3%) were physician assistants. Nine of the respondents (32.1%) completed advanced post-graduate training either through a pharmacy PGY2 residency, pharmacy fellowship program, or a medical fellowship program. The majority (64.3%) of practitioners have been practicing for less than ten years and 60.7% have received the newsletter for one or more years. Ninety-six percent of respondents read the newsletter at least once monthly with 25% reading the newsletter weekly. The topics related to infectious diseases, critical care, and pediatrics were read by 38.7%, 33.9%, and 27.4% of practitioners, respectively. Practitioners believed the newsletter covered topics relevant to their practice (mean Likert score; 4.3), written at a level consistent with continuing education standards (4.5), and promoted change in their healthcare practices (4). Additionally, practitioners found the newsletter informative (4.6), beneficial (4.5), and of appropriate length (4.5). In regards to potential changes that could be made to the newsletter, four (14.3%) wish to see a printed version and 22 (78.6%) request continuing education credit to be provided.

Conclusion: Although practitioners perceived the newsletter to be of benefit in providing medical education, changes to newsletter format and availability of continuing education credit can be considered. This study highlights the utility of a newsletter in educating healthcare practitioners on topics relevant to optimizing current medical practices.

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Session-Board # - 7-092

Poster Title: Evaluation of a pharmacist education program with interventions and readmission rates

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: In 2015, the Centers for Medicare and Medicaid Services expanded the Hospital Readmissions Reduction Program to include patients admitted for a related diagnosis of chronic obstructive pulmonary disease (COPD) in a continued effort to reduce unnecessary medical costs. Pharmacists are uniquely positioned to provide patient education and counseling on COPD. They play a vital role in appropriate device selection, demonstration and evaluation of correct technique and education for healthcare professionals. Pharmacy Times Continuing Education has designed an educational curriculum for pharmacists on the importance of appropriate COPD management to improve patient care and maximize CMS reimbursement by reducing readmission rates.

Methods: There were two accredited activities developed for pharmacists within this initiative, a one-hour online patient case and a one-hour live interactive workshop (PharmSkills®), that provided a comprehensive overview of COPD as a disease state, treatments for COPD and best practices, demonstration of inhaler techniques, and the role of pharmacists as healthcare providers to provide education for patients. Data was collected prior to the training program, known as pre-intervention data, during the same time period in the previous year. Pharmacists were recruited through a regional inpatient academic community hospital. This educational certificate program encouraged the facilitators to interact with the pharmacist attendees and challenged them to apply the knowledge that they have gained from the didactic lessons and patient cases regarding individualized patient therapy. The educational design of the workshop included charts and tables illustrating the data presented by expert faculty to enhance the

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overall learning experience and an interactive device demonstration for technique. A comprehensive workshop containing key slides, cases, and a reference list was provided as further educational reinforcement. Pharmacist learners were required to complete a pre- and post-test to assess knowledge and confidence gained. After the program, pharmacists interacted with patients conducting interventions focused on COPD. At the end of two months, data was collected retrospectively on all patients with COPD that were admitted to the hospital, known as the post-intervention data.

Results: The first initiative was the one-credit patient case that was distributed nationally to over 5,000 learners and had 1,276 participants who completed the pre- and post-test. 19 pharmacists attended the second component with the live training at the hospital, participated in all the requirements of the curriculum, and received a certificate for completion. Baseline characteristics between the pre- and post-intervention data was similar. Factors measured included vaccinations conducted at time of admission, number of interventions related to vaccinations, number of interventions related to steroids, and number of readmissions for patients with primary COPD diagnosis. After the live program, influenza vaccination rates increased to 40% from 17% in the pre-intervention group. 47% of patients were on appropriate steroid treatment compared to 17% in the pre-intervention group. In addition, fifty percent of the interventions related to steroids were accepted by physicians. As a result of the program, readmission rates went from 49% to 20% in patients with primary diagnosis of COPD. At the end of the program, the majority of pharmacists felt they could make an intervention with a health care provider (69%) and felt confident they could teach on inhaler device technique (84%).

Conclusion: The multicomponent PharmSkills® program demonstrates improvement in pharmacist confidence, knowledge, and performance changes, and impacted patient outcomes when providing education regarding COPD management to patients. This curriculum may be a useful tool that can be expanded on a national level as pharmacist involvement in a COPD care team can help with improving vaccination rates, assessing appropriateness of medications, and decreasing steroid use. Most hospitals throughout the country are working on reducing avoidable readmissions. Pharmacists can provide a unique role to the multidisciplinary team to help patients as well as care teams to use appropriate therapy.

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Session-Board # - 7-093

Poster Title: Community engagement opportunities during rotations: outcomes from a community needs assessment approach

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

Primary Author: Elizabeth Hall-Lipsy; The University of Arizona College of Pharmacy;

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Purpose: Community health needs assessments (CHNA) are a key public health activity and a triennial requirement for non-profit hospitals under the Affordable Care Act. Community health needs assessment activities have been successfully incorporated into nursing and medical experiential education as a means of facilitating community engagement. This model was adopted as part of a four- week Introductory Pharmacy Practice Experience (IPPE) rotation in which students assessed the pharmacy needs of their self-selected rural, underserved communities as a part of a community health needs assessment assignment.

Methods: Students self-select a rural, underserved community in which to complete a 4-week, 160-hour IPPE rotation. Prior to the rotation, students attended a 4-hour in-person or video recorded session describing the purpose for and process of conducting a CHNA; students were provided with primary and secondary data collection tools and techniques with which to conduct their community assessment, including key informant interviews, windshield surveys, and health services inventories. Students conducted their primary data collection about their rural community during their four-week IPPE rotation; secondary data was collected before, during and immediately after their rotation. After completing their rotation and upon returning to campus, students completed a written community assessment report and 20-minute presentation for classmates and professional colleagues. Five class cohorts over five years were evaluated for student satisfaction and feedback about conducting their CHNA using a standardized assessment and by thematically analyzing written responses.

Results: A total of 106 students years have completed a community health needs assessment in an underserved community. On a five point scale, students ranked the usefulness of their community assessment learning activities as 4.8 (almost always useful). On the same scale,

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students ranked the amount they learned as a result of doing the community assessment as 4.25, and 65% of students reported learning more than (30%) or much more than (35%) usual. Students reported that their community assessment challenged them to think critically (4.58 on a 5 point scale), with 42% reporting strongly agree. Students ranked the assignment as inspiring interest in the subject matter (4.8 on a 5 point scale) and 47% of students strongly agreed. In qualitative analysis of student feedback, common themes regarding assessing community health needs while on rotation revealed that (1) students felt challenged to think deeper and wider about their community patients needs, (2) students noted improvement in their application of community level data to pharmacy practice, and (3) pharmacy professionals can and should engage with their communities in identifying needs and priorities. Additionally, students appreciated the opportunity to work with instructors as peers on a collaborative project through feedback and sharing of results.

Conclusion: All non-profit hospitals are required to triennially conduct community health needs assessment as an eligibility requirement for non-profit status. However, pharmacy staff and personnel are not frequently part of the community assessment team or activities. This project demonstrates that community assessment activities, which have been successfully implemented in medicine and nursing experiential education, can also benefit pharmacy rotation students. Students strongly identified their satisfaction with completing community assessment activities while on a four-week rural rotation.

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Session-Board # - 7-094

Poster Title: Employment outcomes of a rural health training program: a nine-year longitudinal tracking study

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: One-fifth of the US population (20%) lives in a rural community, but rural pharmacy workforce estimates suggest that fewer than 10% of pharmacists practice in a rural community. Furthermore, rural communities face great challenges in recruiting and retaining healthcare providers, and rural health facilities report provider shortages. For this reason, patients in geographically underserved areas frequently experience poorer health status and health outcomes. Efforts to increase the number of rural healthcare providers across health professions has focused on rural training tracks and implementing rotation training in rural facilities.

Methods: PharmD students are recruited for a rural health training track in the fall of their first professional training year. Students are placed in self-selected rural communities at a minimum of three points during their experiential education: two, four-week Introductory Pharmacy Practice Experience rotations, and for at least one, six-week Advanced Pharmacy Practice Experience rotation. Students are encouraged to select additional rural rotations as their schedule and interest permit. At a minimum, students complete 560 hours of rural training in at least one community pharmacy and one hospital pharmacy. Students admitted to the rural training program are provided a travel stipend and housing for their rural placements that take place in-state. Starting with the graduating cohort of the class of 2010 through the class of 2018 (9 full cohorts), participating students were interviewed at graduation and annually tracked using social media (including LinkedIn and Facebook) and email follow-up to identify employment history. Employment data was coded to identify pharmacy residency program participation, rural employment, in-state employment, in-state rural employment, underserved area employment (as designated by health professions shortage area, medically underserved area, or economically disadvantaged area), and rural track preceptor appointments.

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Results: A total of 121 students have graduated from this rural health training track. A total of 91 graduates (74%) have remained in the state of their PharmD education. Sixty-two pharmacy graduates (51%) were accepted into a pharmacy residency programs, (79% in Pharmacy; 15% in Community; and 6% in Managed Care); 17 graduates (27%) obtained a pharmacy residency in a rural location. Forty students (33%) obtained employment in a rural pharmacy setting in their first post-graduate year; 45 graduates (37%) have ever been employed in a rural setting at some point, and 35 (29%) graduates are employed in rural settings within their state of training. About half of all program graduates obtained employment in an underserved setting. Seventeen graduates (14%) are rural program preceptors actively precepting current rural program students.

Conclusion: Although fewer than 10% of pharmacists practice in a rural location, program graduates show a rural employment rate almost 4 times higher. Rural training experiences can have a positive impact on recruiting rural pharmacists and retaining them, as suggested by the higher proportion of those who have ever been employed in a rural setting. Students exposed to rural health training also were more likely to seek out rural residency programs, and this underscores the opportunity for developing rural residencies to attract pharmacists to rural environments where they can benefit from additional training.

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Session-Board # - 7-095

Poster Title: Characterization, management, and matriculation of challenging pharmacy residents: a national survey of residency preceptors and program directors

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: According to the American Board of Internal Medicine (ABIM), a “problem resident is a learner who demonstrates problem behaviors significant enough to require intervention by program leadership.” Much of the data on challenging residents are from the medical literature, and there is paucity in data among pharmacy residency programs. With the growth of postgraduate pharmacy residency training, programs face difficulties in mitigating and managing challenging residents. The purpose of this study is to identify the incidence of challenging resident trainees, remediation processes, and provide guidance for residency program directors (RPDs) and preceptors on model remediation plans and best practices.

Methods: The ASHP Section Advisory Group (SAG) on Preceptor Skills Development created a 36 question survey for RPDs and preceptors to complete. The survey questions were divided into several domains including: the definition of problem or challenging resident; apparent and underlying causes; remediation; screening for potential problem residents; requirements for graduation; and resident termination. The survey was distributed via ASHP Newslink and ASHP Connect. ASHP members were encouraged to share among residency colleagues to assist in completion of the survey. This is a demonstrative study to provide more information on challenging trainees and management strategies that pharmacy residency programs have employed. Only completed surveys were included in the final analysis. Descriptive statistics were used to analyze quantitative data. Mean and median values were used to calculate

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demographic information. A qualitative thematic analysis, whereas common responses were identified, collected, and analyzed, was conducted for questions with open ended responses.

Results: Of the 228 responses received, 225 met inclusion, which were comprised of 134 preceptors (59.6%) and 91 RPDs (40.4%). Among respondents, 148 (65.8%) represented PGY1, 11 (4.9%) PGY2, and 66 PGY1/PGY2 (29.3%) programs. Over 87% of respondents agreed with the ABIM definition of a problem resident. Approximately 61% of respondents indicated a consistent number of problem trainees over the last 5 years, and 28% indicated an increase. The most prevalent deficiencies were: inefficient use of time (n=124), insufficient clinical judgment (n=97), and unsatisfactory clinical skills (n=96). The most identified causes of deficiencies included: situational, personal, or professional stressors (n =111), lack of communication with preceptors (n=109), and resistance to incorporating feedback (n=90). Most common remediation strategies encompassed more frequent feedback sessions (n=135), extended rotations (n=59), and assigned mentor for structured supervision (n=52). Over the last 5 years, 35% of respondents indicated that they have not strictly enforced graduation requirements at least once. 50% of respondents indicated that they did not feel comfortable granting graduation certificates to at least one resident. A majority of respondents (64%) also indicated they would not feel comfortable hiring at least one of their past residents over the past 5 years.

Conclusion: This surveydemonstrated a majority of residency programs consistently encounter challenging residents, with 28% indicating an increase over the past 5 years. Inefficient use of time and insufficient clinical knowledge were the most common deficiencies in challenging trainees. Causes of deficiencies included stress, lack of communication, and resistance to feedback. A large number of residency programs have not strictly enforced their own graduation requirements and many don't feel comfortable hiring some of their graduates. Programs' awareness to increasing rates of challenging trainees, proactive identification of barriers to success, and implementation of successful remediation strategies may help mitigate challenging resident situations.

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Session-Board # - 7-096

Poster Title: Analyzing preceptor opinions regarding two scheduling formats of inpatient clinical skills IPPE to improve educational outcomes

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Analyze the optimal educational scheduling format for achieving associated educational outcomes and student success for Inpatient Clinical Skills Introductory Pharmacy Practice Experiences (IPPEs). Preceptors were surveyed to evaluate perceived advantages, disadvantages, and achievement of educational outcomes in two formats with a goal of identifying the optimal scheduling design for this type of practice setting. Previously, we assessed the Institutional (dispensing) IPPE format for both student and preceptor opinions. This study reinforces the optimal scheduling format for institutional-based rotations and associated effect on the learning experience.

Methods: Inpatient Clinical Skills IPPEs were offered in two scheduling formats requiring 40 hours each. One was delivered concurrent with didactic classroom teaching during the academic year with two 4-hour days per week over five weeks. The second design was one week (8-hour days) during the summer with no concurrent didactic classroom content. This was a format suggested by preceptor feedback in focus groups. The activities, educational objectives, and assessments tools were identical for both rotation designs. An anonymous survey was developed and sent to preceptors who had exposure to both formats using the Qualtrics® survey tool. Survey items assessed depth of exposure to learning experiences, student stress, commute times, electronic health record navigation, direct patient care, and achievement of educational outcomes. By design, the survey was limited to only preceptors that precepted both scheduling formats for this type of IPPE. Other preceptors were excluded from the survey.

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Results: The response rate was 36 percent (n=13) of possible survey participants. Responses indicated one-week rotation design provided the best experiential learning by 80 percent (n=11) of respondents. Preceptors indicated students receive a better overall educational experience with this design in several key areas. Top benefits indicated on the survey include reduced commute challenges, better focus while on the rotation experience, ability to follow patients on consecutive days, able to attend more key events, such as, committee meetings, and improved patient discussions and questioning. In order to improve curricular design based on this feedback, the school changed the scheduling format of Inpatient Clinical Skills IPPEs. It should be noted that a weakness of the new design format includes a possible reduction in the number or variety of patient types or clinical disease states treated compared to the five-week design and no students completed both formats to assess strengths and weaknesses. In addition, the survey did not assess how this change in format might affect a student's overall internship hours or ability to obtain an internship outside the academic program. One of the important limitations of the overall survey was the limited number of preceptors who precepted both scheduling formats.

Conclusion: Preceptors indicated the five full consecutive day format in the summer provided a better educational experience versus half-day rotations during the academic year. Preceptors felt students gained better ability to follow patient care processes, discuss patient decisions, and ask questions. Programs considering changing to this format should conduct separate focus groups with both preceptors and students. Programs should also assess capacity for the change and reflect on APPE cannibalization. Student learning consideration should be given priority versus preceptor opinion. A previous Institutional (dispensing) study and this survey indicated a better overall learning experience with the five consecutive day experiential course.

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Session-Board # - 7-097

Poster Title: Pharmacy student perspectives of computerized exam software

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Computerized exam software was introduced to a PY 3 pharmacy class. Computerized software was introduced to ease students into testing similar to NAPLEX testing and also to enhance the assessment process at the University level. A 19 question IRB approved survey was administered to the class after 2 semesters of using the testing technology to assess the effectiveness and their perspectives of using the software.

Methods: An IRB approved 19 question survey was administered to the PY 3 students that had utilized computerized exam software in a therapeutics course. Students completed a total of 8 exams using the software. The survey assessed their perspectives on exam performance, testing anxiety and study habits. Exam score averages were also evaluated between the PY 3 year (2016-2017) that used paper exams versus the PY 3 (2017-2018) that used computerized exam software.

Results: The class size of 310 students, 103 students completed the survey (33%). Forty eight percent of students reported that using the software decreased their test anxiety versus the traditional paper test. Sixty eight percent of students did not have any technology issues during the administrations of the exam. Fifty-nine percent of students reported that their study habits did not change when testing with computerized software versus paper exam. Class exam averages showed lower overall exam averages during the year that computerized exam software was initiated.

Conclusion: Computerized exam software was overall well accepted by students. Grade turn around to students was faster. However, exam averages declined. It could be proposed that this was the first year students were exposed to this testing format.

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Session-Board # - 7-098

Poster Title: Delivering interprofessional education through problem-based learning: a collaboration among six health professions institutions

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Interprofessional education (IPE), a collaborative approach in healthcare education, has the potential to improve teamwork and health outcomes. IPE is also a recently required accreditation standard for many professional degree programs. Health professions schools, especially those without allied health university ties, must establish partnerships with external institutions to achieve IPE outcomes and satisfy accreditation requirements. We describe the experience of an IPE collaboration between six health professions schools in southern California.

Methods: Six health professions schools (Keck Graduate Institute School of Pharmacy, University of California Riverside School of Medicine, Riverside City College School of Nursing, California Baptist University Physician Assistant Studies, Moreno Valley College Emergency Medical Services, and Azusa Pacific University School of Nursing) representing seven programs (Doctor of Pharmacy, Doctor of Medicine, Registered Nursing, Vocational Nursing, Physician Assistant, Emergency Medical Services, and Entry-level Masters in Nursing) joined together to establish the Southern California Healthcare Educators Alliance (SoCal HEAL). Faculty champions from each institution collaborated at the grassroots level to develop and implement a series of interprofessional problem-based learning (PBL) events.

Results: Four three-hour interprofessional PBL events were developed and implemented yearly: (1) Roles, Responsibilities, and Stereotypes in Healthcare; (2) Transitions of Care; (3)

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Interprofessional Communication and Opioid Awareness; and (4) Mass Casualty Incident. In addition, a one-hour facilitator training session was delivered to volunteer facilitators before each event. Students were divided into teams with each profession represented and, under the guidance of a facilitator, worked together to solve therapeutic cases requiring critical thinking, teamwork, and communication skills. Students were assigned to the same interprofessional teams from year to year to allow them to build relationships with students of other professions. Students were administered anonymous pre-surveys and post-surveys based on national Interprofessional Education Collaborative competencies. Over the years, these IPE events have grown from about 150 students to over 300 students. Venues were secured at collaborating institutions and most recently at a local convention center. Venue rental was supported by joint grants among collaborating institutions while accessory costs were divided among the schools.

Conclusion: SoCal HEAL, representing six institutions and seven professional programs, has delivered IPE through a series of PBL events to achieve IPE outcomes and satisfy accreditation requirements.

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Session-Board # - 7-099

Poster Title: A synchronous interprofessional patient safety simulation integrating distance learners

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Increasing rates of medical errors necessitate incorporation of patient safety education and development of interprofessional communication and teamwork for health professions students. Accreditation guidelines also emphasize the need for interprofessional education (IPE) and are especially rigorous for schools of pharmacy. Institutions must be innovative in addressing the needs of learners, both campus and distance-based, to meet accreditation requirements. The purpose of this study was to evaluate a synchronous interprofessional patient safety simulation to train students from Dentistry, Emergency Medical Services, Medicine, Nursing, Occupational Therapy, Pharmacy, and Physical Therapy on interprofessional teamwork and communication through recognition of patient safety hazards.

Methods: This study was reviewed by Creighton University's IRB and deemed exempt. The activity was adapted from T3 Train-the-Trainer Interprofessional Faculty Development Program at the University of Missouri Columbia. Two-hundred and one (n=201) unique health professions students in 41 teams, both campus and distance, participated in the event, offered three times, once per semester. Students completed a pre-survey, the Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R) instrument. Demographics obtained included participants' discipline, gender, learning pathway, and year in curriculum. After a pre-brief, teams were guided through the simulated hospital room or home setting by room facilitators. Students observed the setting and were asked to identify hazards that could potentially lead to harm. Distance students simultaneously viewed a recording of the simulation while campus students were on site. A debriefing occurred in a designated room where faculty reviewed the safety hazards present in the room. Distance students teleconferenced during the

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simulation and utilized Zoom technology during the pre-brief and debrief sessions. A post-survey was completed after the activity including the SPICE-R, six additional Likert-scale questions, and reflection questions to gauge the overall success of the exercise. Data from the pre- and post-surveys were analyzed to determine mean change between the SPICE-R scores using a paired student's t-test. Two-way mixed ANOVA was also completed to assess the interaction between demographics and change in SPICE-R scores.

Results: Teams ranged in number from 2-11 students and contained between 2-5 disciplines. Of 201 participants, 168 completed pre- and post-SPICE-R and 153 completed the Likert scale questions. SPICE-R scores significantly improved from 44.81+3.59 to 47.08+3.31 ($p<0.0001$). There was no effect of gender, year in school, discipline, or pathway (campus versus distance) on SPICE-R scores. Interestingly, smaller teams (2-4 members) and two disciplines were associated with greater SPICE-R scores ($P=0.007$ and 0.004 , respectively). For the Likert scale questions, 84% of students agreed or strongly agreed that the activity was a valuable learning experience, 88% agreed or strongly agreed that interacting with other professions was a valuable learning experience, and 81% agreed or strongly agreed that they would use the skills gained on future rotations and in practice. A reflection analysis revealed three themes. Participants acknowledged a deficit in error detection when a discipline was missing, they recognized the importance of interprofessional communication to provide better patient outcomes, and they acknowledge a better understanding of other health professionals' roles and responsibilities.

Conclusion: This unique simulation provided students with an interprofessional collaboration opportunity that significantly improved their perceptions of IPE. The results also suggest that for an early, one-time IPE event, smaller teams with less disciplines may be effective. Accreditation agencies for all health science programs require IPE and collaboration among health professions students. Institutions can implement this innovative method, which incorporates both campus and distance pathway students, to meet IPE requirements.

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Session-Board # - 7-100

Poster Title: To certify or not to certify? impact of ACLS training

Poster Type: Descriptive Report

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: The benefit of pharmacists on code teams is well established in the literature. Data on whether or not these pharmacists should receive ACLS training is limited. This project aimed to compare confidence, in a code response, between pharmacists that have ACLS certification and those that do not. It also sought to determine if ACLS certification is thought to be a necessary component of code response when striving to be a productive team member.

Methods: A literature search was completed to derive a survey that could assess pharmacists comfort level responding to codes with or without ACLS training. The search was unsuccessful in finding a validated tool that would assess our particular outcomes, therefore, a survey was created. The survey was sent to all institutional directors of pharmacy via email, who in turn were asked to forward the survey to their pharmacists. Using skip logic the survey divided results into pharmacists that were ACLS certified and those that were not. The survey asked questions regarding the pharmacist's comfort level preparing medications, assessing algorithms, and making recommendations during the code. The survey also questioned if the pharmacist felt they had been adequately prepared during their time as a student with the knowledge needed to be effective when responding to code situations.

Results: The survey was completed by 103 licensed pharmacists. Of those, 90 practice at a community hospital in the state of Louisiana and only 38% of the pharmacists in the sample are required to respond to codes at their institution. The majority of pharmacists in this sample report that ACLS education was not provided in their pharmacy school curriculum. Of the 82 pharmacists that were not ACLS certified, 24% considered themselves comfortable making recommendations during codes versus 61% of the pharmacist that had ACLS certification. In addition, 52% of those that did not have ACLS certification were not comfortable with

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common ACLS algorithms for code response. For those pharmacists who did not have ACLS certification most (73.1%) were comfortable preparing medications in a code situation. When asked if ACLS certification was something the pharmacists would be interested in 64.6% responded yes.

Conclusion: Pharmacists that are ACLS certified in the state of Louisiana on average are more prepared to give recommendations regarding therapy, recognize common arrhythmias, and also be versed in proper ACLS algorithms while responding in a code situation. Pharmacy didactic curriculum needs further emphasis on ACLS and code preparedness. Pharmacists are interested in becoming ACLS certified whether or not their institution requires pharmacy presence in a code.

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Session-Board # - 7-101

Poster Title: Student perceptions of midterm exam and end-of-semester remediation policies

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: In 2014, the University of Findlay (UF) College of Pharmacy created an ad hoc Student Success Committee to address issues of student retention and attrition. This committee put forth a proposal to implement a comprehensive remediation program, which was approved by a full faculty vote. The purpose of this study was to investigate the perceptions of professional pharmacy students regarding these policies. Because it was desirable to get feedback from all students, both students who had the opportunity to take part in the remediation program, as well as those who did not, made up the survey population.

Methods: This study was approved by the UF Institutional Review Board (#1091), and included all currently enrolled Doctor of Pharmacy students in the first (P3), second (P4), and third (P5) professional year cohorts at the UF College of Pharmacy. To maximize survey response rate, convenience sampling was performed by the secondary investigators who distributed hardcopy surveys to all eligible students during one of their required Pharm.D. classes. Study participants were asked to anonymously complete a 32-question survey in black ink within a 10-minute window. All study participants completed some sections of the survey, while only those students who had taken a remediation examination completed other sections. The purpose of the survey was explained to all participants and implied consent was described in the form of a waiver. Secondary investigators were instructed to leave the room once the purpose of the survey and implied consent were described. Data collection was performed by secondary investigators and compiled into a shared Google form. Survey results were then evaluated for qualitative statistics and identifiable trends.

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Results: A total of 149 students completed the survey in the spring of 2017 and 170 students in the spring of 2018. Over 80% of the students agreed or strongly agreed that the remediation policy is fair and beneficial to the student body. Students believed that implementation of remediation examinations decreased stress on students; however, 67% did not believe that students were using remediation examinations to get more study time. Students who had taken at least one remediation examination reported similar exam preparation for the remediation examinations as for the original examinations. Over 60% of students believed that the remediation examinations should be lengthened to include the same number of questions as the original examinations, but that questions should differ between the two examinations. Greater than 60% believed that the current cut off of 83% to qualify for a remediation examination is appropriate. Most students agreed or strongly agreed that the remediation policy led to improvements in their grade point averages and 40% of the students who qualified for remediation believe this policy helped them to pass a course. Overall, 89% of students believe the College should continue the remediation policy.

Conclusion: The results of these surveys suggest that students at our College support the new remediation policies and are viewed as beneficial for students. This information will be useful as faculty reassess the increased workload and perceived value of these policies now that they have been in place for two academic years. While students are generally satisfied with current policies, some concerns expressed, such as remediation examination length and formatting will be important as efforts to refine the policy are undertaken. These results may also inform other schools of pharmacy who are considering policies to increase student retention and comprehension.

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Session-Board # - 7-102

Poster Title: Evaluation of three American Pharmacists Association professional certificate training programs in a pharmacy curriculum using a graduating class survey

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Fairleigh Dickinson University School of Pharmacy and Health Sciences (FDUSOP&HS) incorporated the delivery of three American Pharmacists Association (APhA) certificate training programs into its graduate curriculum: Medication Therapy Management (MTM), The Pharmacist and Patient-Centered Diabetes Care (Diabetes certificate), and Pharmacy-Based Immunization Delivery (Immunization certificate). The objective of this study was to evaluate the students' perspective on the perceived applicability of these certificate training programs to their future practice and to evaluate the placement of the certificates in the curriculum.

Methods: This was a prospective survey-based cohort study. At FDUSOP&HS, the Diabetes and Immunization certificates are offered in the second and third professional year, respectively. They are delivered over a four-week period as part of the patient care laboratory course. MTM is delivered as a one-day program in the final semester capstone course following APPE rotations. A survey containing thirteen 5-point Likert scale questions recorded students' responses to questions regarding their perception on the applicability of the three training programs to their future practice, their preparedness for the certificate training at the time of delivery, as well as placement of the certificates in the curriculum. The survey also contained one open-ended question that allowed for a free text response. The survey was administered to 77 fourth professional year students after participating in the MTM certificate training in their final course. The same cohort of students had received the remaining two certificates earlier in the curriculum, as part of the integrative laboratory course sequence.

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Results: An overwhelming majority of students strongly agreed/agreed that they will use skills acquired during all three training programs in future practice: MTM (84%), Diabetes certificate (82%), Immunization certificate (84%). For the Diabetes certificate and the Immunization certificate, majority of students strongly agreed/agreed that they prefer those training programs to be delivered as one-day programs (68%). Most students also strongly agreed/agreed that they would prefer for the Diabetes certificate and Immunization certificate to be delivered at the end of the last semester of pharmacy curriculum (57% and 64%, respectively). Most students feel the Immunization certificate is most useful to them out of the three offered training programs (88%). A total of 13 free-text responses were recorded with the most common remark suggesting the placement of the certificates sometime in their final year but not as close to graduation.

Conclusion: Delivery of three professional advanced certificate training programs in pharmacy curriculum is viewed as valuable and applicable by most students. It is considered more beneficial if provided during the last semester of the pharmacy curriculum. Most students feel well prepared for participating in advanced training when delivered later in the curriculum.

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Session-Board # - 7-103

Poster Title: Effect of nursing education and attender's counselling on medication errors: an interventional study

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Medication errors are among the most prevalent errors in any kind of hospital settings, and sometimes have been known to have fatal or near fatal consequences. As nurses work closely with patients; they often get associated with medication administration errors. In absence of corrective interventions to such errors, potential harm to patient can occur; which may even lead to compromising patient safety.

The purpose of this study was to assess the error prevalence in medicine ward of a tertiary care hospital in India before and after conducting nurse's educational classes and attender's counselling as an intervention.

Methods: Prospective, cohort interventional study was carried out in three medicine wards: namely Wing V, Wing VI and high dependency unit (HDU) of a tertiary-care hospital. Measures from 'drug prescribing' to 'documentation procedures' of nurses were sequentially monitored during the routine drug prescribing, ordering, administrating and documentation hours. Three methods: namely Direct observation method, Medication chart review method and Incident report review method were used to collect error data. Cases were reviewed directly by the observer during ward rounds. To detect any documentation errors, medication chart review method was used.

Bedside reconciliation was carried out for every newly admitted patients as well as for patients shifted within the hospital to these wards. Patient medication history interview and medication chart review were used to check any contradictions between prescribed medications and

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medications present in patient's bed side. Ward rounds with the consultants helped analyse the case with associated drug-drug interaction, adverse drug reaction and prescribing error.

Drug administration and documentation of administration time by respective nurse was closely monitored to note any administration and documentation error. Educational classes for nurses were conducted including various safety administration techniques, associated risks, high risk medications and safety precautions as intervention. Furthermore, attenders were counselled on significance of timely refill of prescription and administration of medication during this interventional phase.

Prevalence of medication errors before and after the interventions were observed.

Results: Altogether, 302 patients were analysed and 411 medication errors were identified through three error detection methods. Among them, Direct observation method was found to be the most effective way of error detection comprising of 61.07 percentage (n equals 251) of total error.

Out of 411 errors, 287 (69.83 percent) pre and 124 (30.17 percent) post interventional errors were identified. In Wing V alone, errors dropped from 41.11 percent to 16.82 percentage (p value equals 0.0063). Similarly, in Wing VI errors dropped from 22.14 percent to 10.46 percentage (p value equals 0.056) and in high dependency unit (HDU) errors dropped from 6.56 percent to 2.91 percentage (p value equals 0.063) following the intervention. Medication errors in all the wards were seemingly reduced during post intervention phase however the decrement in each type of error did not show any pattern or sequence of reduction. Overall, the corrective intervention developed by clinical pharmacist on nurse's education and attender's counselling was able to reduce the medication errors in medicine ward and consequently uplift the patient's safety.

Conclusion: Targeted quality improvement education to nurses can significantly reduce medication error's prevalence and swiftly lessen them when implemented correctly. Corrective interventions like teaching and educational classes to nurses, training on administration techniques, risk of errors, high risk medications and safety precautions could decrease possible medication errors. Counselling sessions for patients and attenders was found to be effective in the reduction of such medication errors.

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Session-Board # - 7-104

Poster Title: Second-year data regarding rates and correlates of depressive symptoms in pharmacy residents

Poster Type: Evaluative Study

Submission Category: Precepting/Preceptor Skills/Education and Training

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Purpose: Recently published data indicate rates of depressive symptoms in pharmacy residents approach 40% in March of the residency year. However, these data are limited and have been collected over only one residency year. Presented here are additional data from the 2017-2018 residency year utilizing a similar survey instrument. The objective of this study was to more accurately establish rates and correlates of depressive symptoms in pharmacy residents, and identify novel correlates.

Methods: A time-series study was conducted during the 2017-2018 residency year in which pharmacy residents nationwide were invited to participate in a series of online surveys administered in July and November 2017 and March and June 2018. Survey participants reported demographic data, information regarding residency characteristics, factors external to the residency, and completed the validated 9 Question Patient Health Questionnaire (PHQ9). PHQ9 scores of 10 or greater, which indicate a high likelihood of depression, were correlated with the collected factors and characteristics using logistic regression, controlling for concomitant diagnosis and treatment for depression. Descriptive statistics were used to estimate rates of depression and depressive symptoms.

Results: Surveys sent to 2,131 programs yielded 633 responses on average at each time point. Demographics reflected the nationwide profile of pharmacy residents and included all US regions. Rates of PHQ9 scores greater than 10 were 17 percent (95 percent CI 13.6 to 20.6) in July, 34 percent (95 percent CI 33.1 to 37.6) in November and March, and 38 percent (95

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percent CI 33.5 to 42.0) in June. Rates of severe depression increased from July through March and remained elevated in June (p less than 0.05). External factors protective of depressive symptoms in March include family support (OR equals 0.70), being in a relationship (OR equals 0.82), and adequate sleep (OR equals 0.44). Living far from family increased odds of depressive symptoms (OR equals 1.70). Residency-specific characteristics related to depressive symptoms included an unsupportive director/preceptor, ineffective teaching methods, a poorly structured program, high number of hours worked, high stress levels, and inpatient setting (p less than 0.001). These rates and correlates are consistent with previously published data.

Novel correlates not related to depressive symptoms included income, pharmacy school GPA, or being a parent with children living at home. Exercise (OR equals 0.85, p equals 0.006) was protective of depressive symptoms.

Conclusion: This study produced data consistent with previously published literature regarding rates and correlates of depressive symptoms in pharmacy residents. These data help confirm that pharmacy residents suffer from high rates of depressive symptoms and that residency-specific factors including director support, effective teaching, program organization, and hours worked can influence resident depressive symptoms. These results also may help prospective residents evaluate various factors including sleep and exercise habits, family support, and residency location when selecting a residency program, and assist directors and programs in identifying residents who may be at risk for developing depressive symptoms.

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Session-Board # - 7-105

Poster Title: Adherence to evidence-based care in stroke Lebanese survivors: an observational study

Poster Type: Evaluative Study

Submission Category: Psychiatry / Neurology

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Purpose: Stroke is the second leading cause of death and the third leading cause of disability globally.

Professional guidelines improve the delivery of evidence-based care; however, despite these guidelines, gaps between best evidence-based practice and actual practice persist. To close these gaps in quality of care, several organizations have developed systems to allow healthcare organizations to quantify the quality of their care through performance measures.

The intended purpose of the study is to measure and facilitate improved adherence to guideline recommended care, leading to better outcomes from stroke.

Methods: An observational prospective cohort study was conducted among recent surviving stroke patients identified by codes following the "International Classification of Diseases' 10 (I63 - I61) admitted in 6 hospitals from February-June 2018. Institutional Review Board approval was given from all hospitals. All patients signed an informed consent.

The inclusion criteria included patients aged 18 years or older, of Lebanese nationality, and admitted to the hospital for stroke confirmed by an MRI or brain scan.

Non-Lebanese patients, and those admitted for a transient ischemic attack were excluded. A total of 107 patients were included in the study.

A questionnaire, written in Arabic, was completed. The questions addressed the following topics: socio-demographic and socio-economic characteristics, health indicators, patient's

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lifestyle, drug therapy, and the 2014 AHA/ASA performance measure set for hospitalized patients with stroke. Of the 15 measures assessed for compliance, a composite measure score was calculated using the method established by the Centers for Medicare and Medicaid Services in the Hospital Quality Incentive Demonstration Project. This composite score reflects a summary score of performance of the 7 Get with The Guidelines individual stroke performance measures launched by AHA in 2003; where hospitals achieving more than 80 percent adherence rates on all measures became publicly recognized. It is defined as the total number of interventions performed divided by the total number of possible interventions among eligible patients.

Results: Measures with high baseline performance (those exceeding 90 percent) included deep vein thrombosis prophylaxis (94.4 percent) and discharge antithrombotics (95.3 percent), whereas intravenous thrombolytics and anticoagulation for atrial fibrillation show the lowest level of adherence to guideline recommendations with 19.6 percent and 28 percent respectively. As for the remaining measures the adherence rate was as follows: early antithrombotics (78.5 percent), lipid treatment for low-density lipoprotein higher than 100 mg/dL (44.9 percent), counseling or medication for smoking cessation (82.2 percent). Moreover, our results reveal a composite measure of 26.2 percent demonstrating an overall low level of adherence to evidence-based care.

Furthermore, the results of the multivariable analysis, taking the adherence (yes versus no) as the dependent variable, showed that an increased number of beds was significantly associated with an increased adherence (ORa equals 1.021), whereas working in a private hospital compared to a teaching one was associated with a higher adherence to the guidelines (ORa equals 0.05), with this association tending to significance (p equals 0.08).

Conclusion: Adherence to guideline recommendations in stroke Lebanese survivors is low in the setting of our study. Approximately 74 percent of patients diagnosed with stroke were not treated in accordance with the guidelines. Better compliance with evidence-based care is needed to reduce the burden of stroke in the Lebanese population.

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Session-Board # - 7-106

Poster Title: Dronabinol for the treatment of agitation and aggressive behavior in a hospitalized patient with schizoaffective disorder

Poster Type: Case Report

Submission Category: Psychiatry / Neurology

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Purpose: Medication related outcomes remain suboptimal for many mentally ill patients. Because of this, research continues to focus on novel treatment alternatives for psychiatric conditions. Medications that interact with the endocannabinoid system have gained attention as potential additions to the psychopharmacological armamentarium. Dronabinol is a synthetic delta-9-tetrahydrocannabinol indicated in adults for the treatment of anorexia associated with weight loss in patients with AIDS and nausea and vomiting associated with cancer chemotherapy in patients who have failed to respond adequately to conventional antiemetic treatments. Cannabinoid use has been associated with worsening of psychotic symptoms. However, positive effects on behavior disturbances in patients with dementia and schizophrenia have been reported with dronabinol.

This case report describes the use of dronabinol in a fifty eight year-old male with a longstanding history of schizoaffective disorder, bipolar type and co-morbid diagnoses of cognitive disorder NOS and obsessive compulsive disorder. The patient has a history of numerous inpatient psychiatric hospitalizations due to an inability to remain safe in the community consequent to psychiatric decompensation, including agitation, aggressive and assaultive behavior. His current admission is characterized by frequent periods of threatening and aggressive behavior, including physical assaults primarily directed at male staff. Many of the incidents of aggression have required emergency intervention, including mechanical restraint. Antecedents include patient endorsement of auditory hallucinations of commands to assault. The patient's treatment team has attempted various strategies to manage his behaviors, including multiple medication trials. On 1/3/18 the patient's medication regimen

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included clozapine, chlorpromazine, gabapentin, divalproex and propranolol. At this time, the patient presented with mental status changes that were attributed to clozapine, chlorpromazine and gabapentin. Doses of these medications were reduced, with gabapentin eventually discontinued. To further target aggressive, agitated behaviors, dronabinol 2.5mg daily was added to the patient's medication regimen. The initial dose of dronabinol was tolerated and the dose was increased with one week to a maintenance dose of 5mg in the morning and 2.5mg in the evening. Marked improvement was seen in the number of incidents of aggressive behavior. When these behaviors have occurred, the patient has been highly responsive to re-direction and de-escalation. The patient's last mechanical restraint was on 1/19/18, representing his longest restraint free period in three years. The patient remains on divalproex, but at a lower maintenance dose than prior to the addition of dronabinol. A slow taper of propranolol was undertaken, resulting in a significantly lower maintenance dose than prior to the addition of dronabinol. An upward titration of the clozapine dose was begun on 3/26/18. These medication changes, in combination with an intentional and consistent supportive staff approach have allowed for significant improvement in his psychiatric and behavioral presentation and allowed for discharge planning to begin.

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Session-Board # - 7-107

Poster Title: Evaluation of pharmacy students' perspectives on mental health stigma throughout the four professional years of the doctor of pharmacy program

Poster Type: Evaluative Study

Submission Category: Psychiatry / Neurology

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Purpose: Approximately one in five adults experience mental illness in a given year and about one in twenty five experience mental illness so severe that it hinders their ability to perform basic activities of daily living. While proper treatment of these illnesses is imperative, the stigma surrounding mental illness makes this challenging. The purpose of this study was to evaluate the presence or lack of stigma across the four years of the doctor of pharmacy program at MCPHS University and how the results can potentially help tailor pharmacy curriculums to better understand mental illnesses.

Methods: The study was approved by the MCPHS University IRB, and conducted by distributing paper copies of the Opening Minds Scale for Healthcare Providers (OMS-HC) to all four student classes from the School of Pharmacy-Boston at MCPHS University. The OMS-HC is a validated survey instrument containing twenty opinion-based statements answered on a 5-point Likert scale measuring respondents' perceptions on mental health stigma. Approximately 1,300 copies were distributed anticipating a 50 percent response rate. Students were surveyed voluntarily and anonymously. Incomplete surveys were excluded from the analysis. The primary outcome measure was the three factor solution from the OMS-HC as utilized in Modgill et al (BMC Psychiatry, 2014). These factors included Attitude (six questions), Disclosure and Help-Seeking (four questions), and Social Distance (five questions), and were compared across the four classes, where higher scores indicate worse stigma. The scores for the three subscales were compared using MANOVA, and follow-up ANOVA's on the separate subscales across the

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four classes if the MANOVA showed statistical significance. Where any significant ANOVA's were calculated, a Tukey's HSD post-hoc comparison was performed to determine which specific classes showed statistically significant differences between them. All analyses were performed using IBM SPSS-24, with significance set at p less than 0.05.

Results: Within each class, 42.6 percent of PY1, 62.1 percent of PY2, 42.6 percent of PY3, and 45.7 percent of PY4 students completed surveys. Excluded incomplete surveys were five students in PY1, one in PY3, and four in PY4 which would not significantly affect the results. The overall MANOVA was significant (F equals 2.755, Wilks' Lambda equals 0.952, DF equals 9,1209, p less than 0.005) showing overall differences in stigma attitudes between the four classes. Follow-up ANOVA's showed significant differences between class years for the Attitude subscale (F (3,499) equals 4.853, p less than 0.005) and the Social Distance subscale (F (3,499) equals 5.164, p less than 0.005) but not for the Disclosure and Help-seeking subscale. Tukey's HSD post-hoc (p less than 0.05) comparisons of cell means shows that there were significant differences on the Attitude subscale between PY1 (13.88 plus or minus 4.25) and PY2 (12.01 plus or minus 3.83) as well as significant differences between PY1 (10.86 plus or minus 3.01) and PY2 (9.49 plus or minus 2.95), and PY2 and PY4 (10.83 plus or minus 3.59) on the Social Distance subscale.

Conclusion: Statistically significant differences were found on 2 of 3 sub-scales of the OMS-HC in the survey sample. PY2 students showed a lower degree stigma score than students in other years. Interestingly, the PY2 curriculum is when education on mental illness begins, focusing on depression, anxiety and addiction. However, it was noted that when students continued through the pharmacy curriculum in the PY3 and PY4 years, their views returned to baseline PY1 levels. Therefore, it does not seem that exposure to coursework is sufficient to improve attitudes towards mental health and questions if targeted programs or classwork might be helpful.

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Session-Board # - 7-108

Poster Title: Combination of buprenorphine and samidorphan for the treatment of depression

Poster Type: Evaluative Study

Submission Category: Psychiatry / Neurology

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Purpose: With the rising epidemic of opioid abuse, the development opioid to treat depression is not favored in patients with treatment resistant depression. The use of opioid medications during this time has been challenging due to the risk of abuse and dependence which is a growing concern in the United States. Depression is a risk factor for opioid misuse due to the high incidence of pain correlated with depression. The study's purpose is to identify the relationship of depression and the treatment with an opioid medication. ALKS 5461 a combination of buprenorphine and samidorphan was used treat depression and substance abuse.

Methods: An observational analysis was conducted of the use of buprenorphine and samidorphan in patients with depression that is currently undergoing clinical trials. Presented in the results are the phase 3 study (FORWARD-5 Study) which evaluate the efficacy and safety of ALKS 5461 for the adjunctive treatment of major depressive disorder. The study conducted was a randomized double-blind placebo-controlled trial. Patients who participated received Low dose 2 mg/2 mg of buprenorphine/samidorphan, high dose 8 mg/8 mg buprenorphine/samidorphan, or placebo. Primary outcomes were measured from baseline to the end of 4 weeks with the Montgomery Asberg Depression Rating Scale (MADRS), 17-item Hamilton Depression Rating Scale (HAM-D), and the Clinical Global Impressions severity scale (CGI-S).

Results: The study had 407 participants enrolled and randomized. An anti-depressant response was shown in 4 weeks with both the lower and high doses, but there was a more significant effect that was observed in the lower 2/2 mg dose group. The combination medication was well tolerated by patients and had no evidence of opioid withdrawal on treatment discontinuation. Low dose medication showed clinical significance and superiority to placebo with MADRS-6 and

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a p-value of 0.018 and overall symptoms of depression with MADRS-10 and a p-value of 0.026. The study used to evaluate the results was from Opioid Modulation With Buprenorphine/Samidorphan as Adjunctive Treatment for Inadequate Response to Antidepressants: A Randomized Double-Blind Placebo-Controlled Trial by Fava M and also using the study Depression and Prescription Opioid Misuse Among Chronic Opioid Therapy Recipients With No History of Substance Abuse by Grattan A, Sullivan MD, Saunders KW, Campbell CI, Korff MRV. Both sources were evaluated to provide the results listed above.

Conclusion: ALKS 5461 which is a combination of buprenorphine, a μ -opioid partial agonist which does not activate the receptors fully, and samidorphan a potent μ -opioid antagonist, which could demonstrate antidepressant activity without the addictive effect. The buprenorphine/samidorphan combination has promising benefits for treatment of major depressive disorder for patients who have not had adequate response to standard antidepressants.

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Session-Board # - 7-109

Poster Title: Justifying implementation of a prescription drug misuse course: pharmacy evaluation of prescription drug misuse and marijuana abuse by adolescent males from a residential treatment center

Poster Type: Descriptive Report

Submission Category: Psychiatry / Neurology

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Purpose: Marijuana and prescription medications are the second and third most abused or misused substances by teenagers, only behind alcohol. Monitoring the Future (MTF) survey data from 2017 reported that within the past year, 11 percent of twelfth grade students have misused prescription medications and 24 percent of combined eighth, tenth, and twelfth grade students have abused marijuana. Investigators sought to compare Residential Treatment Center (RTC) patient prevalence of marijuana abuse and prescription drug misuse to determine if they coincided with or exceeded national estimates in order to justify implementation of a pharmacy led prescription drug misuse and/or marijuana abuse course.

Methods: This was a single center, retrospective cohort within a 30-bed RTC program with a 152 day average length of stay at a rural pediatric and adolescent behavioral health facility. The pharmacist completed a retrospective chart evaluation of all patients discharged from the program following treatment of serious emotional, behavioral, or psychological difficulties, which consisted of male patients aged 12 through 17 years old. Marijuana abuse within the past year was determined by positive marijuana drug screening results upon admission or following return from therapeutic leave. Patients with orders to crush psychotropic medications due to a history of “cheeking” medications (taking more medication than prescribed and/or sharing with another patient) during RTC program participation were defined as prescription drug misusers. The primary outcome was to determine if the RTC program prevalence of marijuana abuse and prescription drug misuse differed from the reported national data. A

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secondary outcome was to determine if there was a significant difference in the proportion of patients with combined marijuana abuse and prescription drug misuse versus marijuana abuse alone. All statistical analyses were conducted using a Fisher's exact test with an alpha level equal to 0.05.

Results: Of the 68 patient charts reviewed, 17 patients (25 percent) had abused marijuana and 23 patients (33.8 percent) were classified as prescription drug misusers. The prevalence of prescription drug misuse for RTC patients was significantly higher than the reported national prevalence (33.8 percent versus 11 percent, p equals 0.0004). Prevalence of marijuana abuse was also higher for RTC patients compared to national estimates; however, this difference was not statistically significant (25 percent versus 24 percent, p equals 1). Of the 68 patients evaluated, the proportion of patients with combined marijuana abuse and prescription drug misuse compared to the proportion of patients with marijuana abuse alone was not statistically significant (8.8 percent versus 16.2 percent, p equals 1).

Conclusion: The frequency of prescription drug misuse by RTC patients is higher than national estimates; however the marijuana abuse rate is consistent with national data. Positive marijuana drug screenings upon admission should not be an indicator of potential prescription drug misuse within the RTC program. With one-third of RTC patients misusing prescription medications, all RTC patients will be targeted for prescription drug misuse education, in addition to marijuana abuse education. The reduction in prevalence of prescription drug misuse within the RTC program will also be assessed following implementation of a pharmacy led prescription drug misuse education course.

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Session-Board # - 7-110

Poster Title: Aripiprazole lauroxil nanocrystal dispersion: a potential 1-day initiation regimen for long-acting aripiprazole lauroxil

Poster Type: Evaluative Study

Submission Category: Psychiatry / Neurology

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Purpose: Aripiprazole lauroxil (AL), a long-acting injectable antipsychotic indicated for the treatment of schizophrenia, requires 21 days of oral aripiprazole upon initiation. To provide a greater range of options for this critical initiation period, a 1-day initiation regimen has been developed utilizing a nano-crystalline milled dispersion of AL (ALNCD). The smaller nano-particle size enables faster dissolution, which is intended to yield rapid achievement of target levels of aripiprazole when ALNCD is given with the first AL dose. Here, we report the findings of a pharmacokinetic and safety study evaluating the 1-day initiation regimen.

Methods: The 1-day initiation regimen consisted of a single injection of ALNCD and a single 30 mg dose of oral aripiprazole that, together, was hypothesized to achieve aripiprazole concentrations comparable to the 21-day regimen. This was tested in a blinded, randomized, phase 1, pharmacokinetic, safety, and tolerability study that compared the 1-day with the 21-day initiation regimens. Patients were randomized 1:1:1:1 to either the 1-day initiation regimen or the 21-day initiation regimen (15 mg/day oral aripiprazole), plus a single starting dose of AL 441 or 882 mg given on the first day of either regimen.

Results: In total, 161 patients were enrolled and 133 patients completed the study. Each 1-day initiation regimen group had comparable observed aripiprazole exposure to each corresponding 21-day initiation regimen group. Overall, the most common adverse events (greater than or equal to 5.0%) were injection-site pain, headache, increased weight, insomnia,

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dyspepsia, and anxiety. In total, nine akathisia events occurred (four events in four patients and five events in two patients in the 1-day and 21-day initiation regimen groups, respectively; eight of these were mild and none led to discontinuation).

Conclusion: The combination of ALNCD and 30 mg oral aripiprazole (as part of a 1-day initiation regimen in conjunction with AL) was a well-tolerated, adequate substitute for 21 days of oral aripiprazole. ALNCD may offer an alternative AL starting regimen to ensure appropriate levels of antipsychotic coverage throughout the initial 21 days of treatment.

The authors would like to thank Marjie L. Hard, Ph.D. for her contributions to the analyses of the study.

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Session-Board # - 7-111

Poster Title: Exploring facilitators and barriers to medication error Reporting among healthcare professionals in qatar using the Theoretical domains framework: a mixed-methods approach

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Medication errors are defined as, ‘any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient, or consumer’, are highly prevalent, with associated global costs of US\$ 42 billion annually. There is a lack of robust, rigorous mixed methods, theory informed studies of the facilitators and barriers of medication error reporting. This study aimed to quantify and explain behavioural determinants relating to error reporting of healthcare professionals in Qatar as a basis of developing interventions to optimise the effectiveness and efficiency of error reporting.

Methods: A sequential explanatory mixed methods design comprising a cross-sectional survey followed by focus groups in Hamad Medical Corporation, Qatar. All doctors, nurses and pharmacists were invited to complete a questionnaire which included items of behavioural determinants derived from the Theoretical Domains Framework (TDF), an integrative framework of 33 theories of behaviour change. Principal component analysis (PCA) was used to identify components, with total component scores computed. Differences in total scores between demographic groupings were tested using Mann-Whitney U test (2 groups) or Kruskal-Wallis (>2 groups). Respondents expressing interest in focus group participation were sampled purposively, and discussions based on survey findings using the TDF to provide further insight to survey findings. Ethical approval was received from Hamad Medical Corporation, Robert Gordon University, and Qatar University.

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Results: One thousand, six hundred and four questionnaires were received (67.9% nurses, 13.3% doctors, 12.9% pharmacists). Questionnaire items clustered into six components of: knowledge and skills related to error reporting; feedback and support; action and impact; motivation; effort; and emotions. There were statistically significant higher scores in relation to age (older more positive, $p < 0.001$), experience as a healthcare professional (more experienced most positive apart from those with the highest level of experience, $p < 0.001$), and profession (pharmacists most positive, $p < 0.05$). Fifty-four healthcare professionals from different disciplines participated in the focus groups. Themes mapped to nine of fourteen TDF domains. In terms of emotions, the themes which emerged as barriers of error reporting were: fear and worry on submitting a report; that submitting was likely to lead to further investigation which could impact performance evaluation and career progression; concerns over the impact on working relationships; and the potential lack of confidentiality..

Conclusion: This study has quantified and explained key facilitators and barriers of medication error reporting. Barriers appeared to be largely centred on issues relating to emotions and related beliefs of consequences. Quantitative results demonstrated that while these were issues for all healthcare professionals, those younger and less experienced were most concerned. Qualitative findings highlighted particular concerns relating to these emotional aspects. These results can be used to develop theoretically informed interventions with the aims of improving the effectiveness and efficiency of the medication reporting systems impacting patient safety.

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Session-Board # - 7-112

Poster Title: Perspectives of healthcare professionals in qatar on causes of medication errors: a mixed methods study of safety culture

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) in the United States (US), defined Medication error as ‘any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient, or consumer’ . There is a lack of robust, rigorous mixed methods studies of patient safety culture generally and notably those which incorporate behavioural theories of change. The study aimed to quantify and explain key aspects of patient safety culture which were of most concern to healthcare professionals in Qatar

Methods: A sequential explanatory mixed methods design of a cross-sectional survey followed by focus groups in Hamad Medical Corporation, Qatar. All doctors, nurses and pharmacists were invited to complete the Hospital Survey on Patient Safety Culture (HSOPS). Respondents expressing interest in focus group participation were sampled purposively, and discussions based on survey findings using the Theoretical Domains Framework (TDF) to explain behavioural determinants. The questionnaire was adapted from AHRQ HSOPS, piloted and test-retest reliability was assessed in pilot respondents by requesting that the questionnaire be completed on a second occasion within an interval of two weeks. All doctors, nurses and pharmacists working within HMC were eligible to participate, with no exclusions. For focus group, to clarify, explore and explain issues identified in the survey phase, a qualitative approach was employed. Respondents of the survey who expressed interest in participating in

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the focus groups were sampled purposively. Descriptive analysis and appropriate inferential tests for association were used for questionnaire survey, and the focus group, data analysis followed the Framework Approach, using TDF domains deductively for to generate a coding framework.

Results: One thousand, six hundred and four questionnaires were received (67.9% nurses, 13.3% doctors, 12.9% pharmacists). HSOPS composites with the lowest levels of positive responses were non-punitive response to errors (24.0% positive) and staffing (36.2%). Specific TDF determinants potentially associated with these composites were social/professional role and identity, emotions, and environmental context and resources. Thematic analysis identified issues of doctors relying on pharmacists to correct their errors and being reluctant to alter the prescribing of fellow doctors. There was a lack of recognition of nurses' roles and frequent policy non-adherence. Stress, workload and lack of staff at key times were perceived to be major contributors to errors.

Conclusion: This study has quantified areas of concern relating to patient safety culture in Qatar and explained behavioural determinants. Rather than focusing on changing behaviour at the individual practitioner level, action may be required at the organisational strategic level to review policies, structures (including resource allocation and distribution) and processes which aim to promote patient safety culture

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Session-Board # - 7-113

Poster Title: Assessment of glycosylated hemoglobin (A1C) and foot examinations in low-income, uninsured patients with diabetes and efficiency of performing screenings in a free health clinic

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: This community free health clinic is a stand-alone 501c3 non-profit facility with an in-house pharmacy providing medical care and laboratory services at no cost to low-income, uninsured patients. This clinic is staffed by volunteer healthcare professionals to help the patients manage chronic health conditions, including diabetes, and prevent unnecessary emergency room visits and hospitalizations. The purpose of this study was to a) assess the effectiveness of the patient-centered team care on two diabetes-related quality measures-A1C and foot examinations, and b) review the efficiency of performing multiple laboratory measurements and screenings.

Methods: This retrospective 20-month chart review study included 169 patients (92 females, mean age 52.7 years-range 20-81 years) with diabetes from baseline-September 2016 to end of study-April 2018. The number of patients varied for the two quality measures. Of the 169 patients, 162 had A1C data and 142 had foot examinations data documented in the newly-implemented Athena Electronic Health Record (EHR). Per North Carolina Department of Health-Medicaid Services guidelines, the clinic chose the goal of A1C less than 9 percent to control diabetes-related complications. Per American Diabetes Association guidelines, the clinic chose the goal of at least one to two A1C tests and at least one to two foot examinations (exams) for foot ulcer, infection and neuropathy in the 20-month study, unless more frequent evaluations were needed to manage diabetes-related complications. Paired-t-test was used to assess the level of significance for A1C with P less than 0.05 for significance. Microsoft Excel

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was used to evaluate the descriptive statistics for percentages, means, ranges and standard deviations (STD). This study was exempt from Institutional Review Board approval, because the consent to share the de-identified data was provided by the individual patients on registration.

Results: Quality measure 1: A1C (N equals 162 of 169). The mean A1C was 8.4 percent (range 4.1-15.7, STD 2.57) at baseline and 8.1 percent [range 4.9-15.6, STD 2.57] at the end of the study, P-not significant. The mean A1C drawn was 3 [range-1-6, STD 1.57]-one A1C per 6.7 months. At the end of study, 117 of 162 (72.2 percent) met the clinic's goal of A1C less than 9. Of these 117 patients, 104 maintained baseline A1C of less than 9, and 13 improved to A1C less than 9. Forty-five of 162 patients did not meet the clinic's A1C goal. Of these 45 patients, 36 remained with their baseline A1C more than 9, and 9 increased from baseline A1C less than 9 to A1C more than 9. All 162 patients (100 percent) met the clinic's goal of at least one-to-two A1C. However, 94 of 162 patients had three to six A1C.

Quality measure 2: Foot exams (N equals 142 of 169). The mean exam number was 3.6 [range-1-10, STD 2.4]-one exam per 5.6 months. At the end of study, all 142 patients (100 percent) met the clinic's goal of one-to-two exams. However, 82 of 142 patients had three to ten exams.

Conclusion: This free health clinic stabilized A1C to less than 9 in 72.2 percent, performed at least one to two A1C tests, and foot examinations for all patients effectively. However, as A1C less than 9 is a modest goal, this clinic plans to devote additional resources to lower A1C in patients with A1C more than 9. The clinic will also reevaluate the multiple A1C tests and foot exams performed to maximize the efficiency of its resources. Finally, increased data documentation in the newly-implemented EHR may help the clinic improve its quality measures and adapt its resources to continue serving the community

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Session-Board # - 7-114

Poster Title: Operating room (OR) pharmacy remodel preparation and implementation using lean six sigma concepts leads to decreased errors and inventory

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Safety, efficiency, and inventory management are important factors to consider when recreating a pharmacy layout as well as the policies and procedures. Inefficient pharmacy layout can lead to errors, increased inventory, and increased work time. This project was designed to decrease the amount of excess work completed by pharmacy staff, while implementing safety precautions and decreasing the amount of inventory kept in the OR pharmacy.

Methods: Two pharmacists and two pharmacy technicians worked with a Lean Six Sigma team to redesign the layout of the pharmacy and address policies and procedures to decrease errors. Tools such as spaghetti diagrams, 5S future state graphs, and value stream mapping were used to reconfigure the pharmacy layout. Procedures such as 5 Whys and organizational process flow charts were used to evaluate errors happening in the operating room pharmacy. Pharmacy errors were recorded on an operating room pharmacy dashboard before and after the project. The cost of medication inventory was recorded in January 2017 before the project began and in January 2018 after the first phase of the lean six sigma project was implemented. Attitudes from the pharmacy staff were evaluated by interviewing technicians and pharmacists before the project and once the project was completed. Once the two-phase project was finished, improvement was evaluated using error rates, inventory cost, and staff feedback.

Results: The remodel was a two-phase project that took place over a year. Once the re-model was complete, pharmacists were moved further away from the dispensing window so they had fewer distractions, which led to positive feedback regarding the remodel as well as decreased errors due to reduced distractions. The pharmacy technicians relocated the automated

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dispensing machine closer to the dispensing area to decrease walking time. Medications were repositioned to a location where they were easily retrievable after the remodel. The lean six sigma implementations started in January 2017 and the final phase occurred in April 2018. In May 2017, there were 18 reported errors versus 5 reported errors in May 2018. From January 2017 to January 2018, inventory costs in OR pharmacy approximately decreased by \$17,000.00.

Conclusion: The operating room pharmacy remodel not only improved pharmacy workflow and increased pharmacy workspace, but also decreased the error rate and the amount of inventory in the operating room pharmacy. Implementing a lean six sigma project in other areas of the hospital may provide benefit as well.

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Session-Board # - 7-115

Poster Title: Analysis of pharmacist-led interventions on prescribing errors for rational drug use in a tertiary hospital

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: Prescription review by pharmacists is important for achieving cost-effective drug therapy as well as ensuring patient safety and drug efficacy. Pharmacists act as interceptors, detecting and rectifying errors in prescriptions before they reach the patient, and expand their roles in reducing medical expenses and improving medication compliance. The purpose of this study is to analyze the types of prescribing errors intervened by pharmacists and to investigate the causes of inappropriate medication orders considering the characteristics of patients, which can be used as basic data to search for preventive measures of prescribing errors.

Methods: Electronic prescribing is standard system in tertiary care in Korea. It has computerized decision support tools automatically checking for things like contraindication, maximum daily dose and drug interaction, and provides alerts to let the prescriber know and revise during prescribing process. Pharmacist's audit was used as a secondary filter for eliminating errors from entered prescriptions. Pharmacists in an outpatient pharmacy conducted prescription review and contacted prescribers for clarification or amendment before dispensing as part of their routine pharmacy practice. These included inspections of mismatch of drug name and diagnosis, dose and frequency based on patient information including body weight and renal function, administration time and route, dosage form, drug strength, prescription days, drug quantity, duplication, dispensing method, specific instructions written and adherence to hospital regulations. Errors detected by pharmacists and their interventions were recorded on electronic system. The electronic records from January to December 2017 were analyzed and categorized according to the error type. Furthermore, the expected effect of interventions was assessed in terms of efficacy, safety, cost-effectiveness, improving compliance, and reducing unnecessary medical expenses.

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Results: Eight hundred sixty-six interventions were made through prescription audits during 2017. Major types of prescribing errors were duplication of the same active ingredient or drug class (21.5 percent), improper dosage (17.4 percent), wrong selection of drug strength (14.4 percent) and wrong duration (14.3 percent). It was found that pharmacists made interventions mainly related to patient safety (39.7 percent), efficacy (28.1 percent), compliance (14.2 percent) and avoidance of unnecessary expenses or hospital visits (12.1 percent). The most common departments which prescriptions intervened by pharmacists belonged to were nephrology, hemato-oncology and psychiatry. Duplication was the most frequent error in nephrology patients, which was thought to be due to complex co-morbidities requiring numerous medications in patients with chronic renal disease. Wrong duration was the most common error type in hemato-oncology patients, including cases that supplementary medicines for the treatment of cancer were prescribed longer or shorter than the required or recommended period. For psychiatry patients, intervention on wrong selection of drug strength accounted for 44.6 percent. Many psychiatric drugs were available in various strengths, but it was prescribed for patient to divide a high-strength tablet or take two or more low-strength tablets for a single dose.

Conclusion: Prescription audit and error reporting system have a positive impact on quality of pharmacotherapy. The analysis of pharmacist's intervention after prescribing can be used to derive improvements for more effective electronic prescribing system. Modified system targeting specific types of error and patient-specific decision support tools are expected to be useful for reducing prescribing errors and promoting rational use of medication.

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Session-Board # - 7-116

Poster Title: Safe management of sepsis and septic shock in the emergency department

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: To describe the implementation of a protocol for the management of sepsis and septic shock in patients who are admitted to the Emergency room of a tertiary hospital.

Methods: Descriptive study of a protocol, developed by the Emergency Pharmacy Specialist in agreement with the SU as well as the infectious and tropical disease unit, and integrated into the electronic medical record (HC; Selene®)

The most current clinical practice guidelines (CPGs); NICE guideline, International Guidelines for Management of Sepsis and Septic Shock, Ottawa clerkship guide to emergency medicine, were reviewed as well as the recommendations of the Antimicrobial Stewardship Programs of our hospital

Results: The protocol was integrated into the EMR. Different sections were created: Serotherapy, Vasoactive Drugs, Allergic/Non-allergic patients to β -lactams and non-pharmacological lines. A prescription line of 0.9%SF:30 mL/kg to be administered in the first 3 hours, was created. Noradrenaline (NA) was established as the drug of choice. Dopamine was chosen as an alternative to NA in patients with low risk of tachyarrhythmia and absolute or relative bradycardia and Dobutamine in those with evidence of hypoperfusion despite adequate fluid loading and use of vasopressors. Antimicrobial treatment was established according to whether or not the patient had an allergy to β -lactams. Each section was associated with 2 different subsections depending on the suspected focus: known (respiratory, abdominal, skin and soft tissue, urinary) or not known (community, nosocomial, compromised

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immunity). Antimicrobial treatment was associated following the CPGs (initiate empirical treatment with at least 2 different classes of antimicrobials to cover the most common pathogens, in cases of bacteremia or sepsis without shock, the antimicrobial combination was not routinely recommended) and those of the Antimicrobial Stewardship Programs to guarantee cost-effective treatments. The initial and maintenance dose for each antimicrobial was indicated. In the non-pharmacological lines: administration of antibiotherapy in the first hour after diagnosis, blood culture; continuous monitoring of heart and respiratory rate and blood pressure; strict diuresis and oxygen therapy $\text{SatO}_2 > 90\%$, were specified. The requested analyses also were protocolized.

Conclusion: Sepsis and septic shock are important health problems. Their early identification and the appropriate management of the treatment in the initial hours after diagnosis, where the clinical pharmacist has an important role, improves the results

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Session-Board # - 7-117

Poster Title: Standardized prescription medication directions at a specialty pharmacy

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: Specialty pharmacies such as Avella dispense critical medications with complex directions. Pharmacies in the specialty setting can benefit from standard prescription directions. Multiple studies and quality implementations have been made on both organizational and government levels regarding prescription directions in efforts to prevent the receiving of instructions containing the wrong dose, duration, frequency and other prescription information. We created a standard set of prescription directions for select specialty medications at Avella pharmacy to reduce errors and increase patient safety.

Methods: Standardized directions for 100 specialty medications were created and made searchable by drug name upon data-entry. The specific terminology was selected based upon survey results from 22 Avella pharmacists nationwide. The most common dose for 10 high volume medications was evaluated for sig variance and incorrect directions across two of Avella's Arizona distribution sites, with a 2-week adjustment period post-intervention to allow for technician training. Fifteen prescriptions were randomized for each of the 10 chosen medications both pre and post-intervention. Primary outcomes included quantitative sig code variance (chi-squared), and technician efficiency, which was measured by time for data entry in seconds and error rate (paired t-test). Secondary measures included direction misses and pre-post intervention surveys of technicians.

Results: There was a significant 40% reduction in variance in the prescription directions given to the patient post-test. (p-value 0.02, Yates' chi-square 5.20). The medications with the highest reductions in variance included cancer medications, such as Revlimid. Misses were observed over the 300 medications both pre and post intervention, although the reduction in misses

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post-test was not statistically significant. Misses were identified as the difference between provider instruction and prescription directions including incorrect strength in sig, incorrect dosage, and English directions when Spanish directions were specifically requested by the provider. Technicians were observed to have an improvement in data-entry time of 31.99 seconds post-intervention, but this was not statistically significant (paired t-test p-value=0.079). A statistically insignificant improvement was observed in data-entry errors, with an improvement from 22.85% to 18.31% (p-value=0.257). Technician perceived time and accuracy in data-entry compared to pre-intervention showed no statistically significant difference. Despite this, technician impressions of the project included a couple of notes in regards to the project simplifying their work and saving time. A technician also noted that there were more rejections on particular drugs when using the sigs because individual pharmacists had individual preferences.

Conclusion: Reduction in prescription direction variance was observed following the intervention, with the most significant reduction in variance being in the oncology medications. Technicians qualitative feedback supported the signature directions as being an efficient addition to their workflow, however, further study is needed to determine if significant reductions in data entry efficiency may be measured over time. Adoption and training on the new workflow may garner greater adoption and gains in patient safety as well as technician efficiency.

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Session-Board # - 7-118

Poster Title: Practice gap analysis for the subcutaneous insulin management at a community teaching hospital compared to the 2017 Institute for Safe Medication Practices (ISMP) guidelines.

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Insulin, a high-alert medication, continues to be associated with medication errors. In 2017, the Institute for Safe Medication Practices (ISMP) published a guideline with 32 recommendations to promote best practice for safe subcutaneous (SC) insulin management in adult patients. The recommendations are grouped into four major categories: prescribing, pharmacy distribution and management (PDM), administering/monitoring, and safe transitions of care (TOC). The purpose of our evaluation is to compare our hospital SC insulin management to the ISMP guidelines and identify the gaps in our practice, and barriers for implementation of the ISMP recommendations.

Methods: For our 198-beds community teaching hospital, we compared the SC insulin management to the 32 ISMP recommendations by evaluating our processes and practice within the four categories over a one-month period. We developed a gap analysis tool to compare the recommendations with the processes currently in place, determine the gaps between our practices and the recommendations, identify the barriers and challenges for implementation and prioritize the recommendations to be implemented. Our practice was identified as “Meet” or “Not Meet” the ISMP recommendation in our gap analysis tool. The practice was deemed as “Not Meet” if it was partially meeting a recommendation.

We obtained the data needed to complete the analysis through various methods: review of institution policies and procedures related to insulin management, staff interviews (providers,

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pharmacists, pharmacy technicians, nurses), direct observation of processes (storage, administration, monitoring) and evaluation of our current prescribing practice (review of order sets and clinical decision support available). In addition, we conducted a one-day prevalence survey to identify the percentage of basal, nutritional, and correctional insulin orders for adult patients as a reflection of our institution's current prescribing practice. For the survey, we included all hospitalized adult patients on the survey day and patients who were receiving SC insulin at the time of the survey were identified, and the details of their SC insulin orders were recorded.

Results: Our analysis identified practice gaps in seven out of 31 recommendations. One of the 32 recommendations related to prescribing practice of insulin pen for outpatients could not be assessed. Out of nine prescribing related recommendations, five (55%) were not met: indication of SC insulin documentation, identification of target glucose in health record outside of insulin orders, order set utilization, use of sliding scales and communication of diabetes care in one area of electronic health record. Despite availability of an evidence base order set; prescribers were ordering SC insulin more frequently outside of the order set. Out of 40 patients receiving SC insulin at the time of the point prevalence survey, 27 (67%) patients were prescribed SC insulin as sliding scale alone. Out of nine PDM-related recommendations, two (22%) were not met: dispensing basal insulin in labeled prefilled syringes and confirming indication of SC insulin upon verifying. All recommendations related to administration and monitoring and safe TOC were met.

Our medication room inspections revealed multiple open vials at the same time. All vials were within the beyond use date labeled by pharmacy except for one glargine vial that was found and sent for pharmacy to waste.

Conclusion: Our hospital can benefit from adjusting prescribing and PDM practice to enhance patient safety. Pharmacy preparation of basal insulin syringes may even lead to cost savings by minimizing waste of expensive glargine vials. Three of the five “non-meet” prescribing recommendations had no major barriers for implementation and can be prioritized as achievable in the short term. Altering the practice to eliminate the use of sliding scale insulin as sole strategy to manage hyperglycemia will be more challenging to change overnight; however, a multidisciplinary approach to promote the usage of our evidence base order set may help reduce such practice

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Session-Board # - 7-119

Poster Title: Zero-harm: embracing a concept, empowering your staff

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Mount Carmel Health System is a four hospital system located in Columbus, Ohio. ZeroHarm, a pathway to build a high-reliability organization, was introduced to our institution at a system-level and involved mandatory in-person training to all employees. Key principles to ZeroHarm include preoccupation with failure, sensitivity to operations, reluctance to simplify, commitment to resilience, and deference to expertise. From these key principles, all employees are held to five guiding behaviors simplified to the acronym START (Speak up, Teamwork, Attention to detail, Reliable communications, and Think it through).

Methods: The department of pharmacy quality and safety committee convened and established subcommittees based on key principles of ZeroHarm that were not already addressed. The initial groups that were developed by a core group of pharmacist and pharmacy technician stakeholders within our department include 5:1 positive feedback, constructive feedback, central operational improvement and innovation committee. The 5:1 positive feedback group targets projects to improve communication and recognition of staff excellence throughout the department. Projects included a kick-off positive feedback week for intradepartmental participation. The constructive feedback committee reviews errors reported through our adverse event reporting system that pharmacy may have an opportunity to improve an operational process, develop clinical education for staff, or discuss high-risk practices with our medical and nursing colleagues. Initial projects for this group include standardization of our peritoneal dialysis ordering, as well as clinical and operational evaluation of our neonatal intensive care unit order review and dispensing practices. Our central

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operations improvement committee is primarily technician inspired and driven allowing for projects including crash cart and unit inspection process improvement as well as proper medication storage projects evaluating processes for safe and effective distribution. The innovation team's initial project is tasked with identifying strategic safety concerns which have not occurred but have the potential to cause harm.

Results: The clinical and operational process changes are reviewed with the appropriate department manager and then critically evaluated. A plan is devised and implemented with a structured review process for appraisal of changes made. Minor process changes are evaluated and implemented through an SBAR (situation, background, assessment, recommendation) tool. Major process changes are evaluated via an action document (in depth SBAR). Once proposed to an appropriate manager, an A3 process map is developed by front-line staff, which then is implemented and evaluated for efficacy.

Conclusion: This overall process has empowered our front-line staff (both pharmacists and technicians) to develop creative solutions to clinical and operational process concerns. This has allowed our department management team to have better communication with our front-line staff and empower them to improve their professional development. Additionally it has reduced pressure from clinical and operational managers on extra projects that require or highly benefit from front-line staff input and involvement.

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Session-Board # - 7-120

Poster Title: Medication mismanagement: medication errors and adverse drug events associated with complexities organizing and administering medications in U.S. adults

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: Medication management is routinely studied within the healthcare settings, but administration errors outside of acute care facilities can also pose significant risks. Medication mismanagement is defined as the inability to self-administer a medication regimen as prescribed where deviations from compliance are due to lack of ability and are unintentional. This research project aims to identify and evaluate the extent to which medication errors and adverse reactions occur as a result of medication mismanagement.

Methods: This research study was determined to be exempt by the Western Institutional Review Board. Original data was collected from 4,993 individuals that participated in the study via a structured thirty two minute online survey from October 30th to December 4th in 2017. To qualify for the survey, participants were required to be: aged 18 years or old; visited a pharmacy at least two times to pick up a prescription within the past six months with at least one of the trips taking place within the past month; are part of the decision making process when choosing the pharmacy location they visit; and take at least one daily prescription either orally or non-orally. Data was weighted to reflect the US population. Patients self-reported information on current medications as well as practices, attitudes, and behaviors for organizing and administering medication regimens.

A supplemental targeted literature search was conducted to evaluate the clinical and economic costs of medication errors and adverse reactions as a result of medication mismanagement.

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Medical Subject Headings (MeSH) and pre-defined keywords were used to conduct a search in PubMed and Google Scholar.

Results: Patient characteristics were: median age 55 years old, managed 6 medications, 96% responsible for their own medication management, 55% did not use a device to manage medications (vials), 39% used pill box, 6% other.

Twenty eight percent of respondents were uncertain whether their medication was taken or not, of which nearly one-third recall being at least somewhat worried about the experience. Ninety four percent of respondents that experienced uncertain/missed doses or an adverse reaction used either no device (vials) or pill box. Hodges et al. reported the rate of medication errors resulting in serious medical outcomes increased 100% from 2000 to 2012. Major medication errors were dosing errors (19.8%), taking or administering the wrong medication (18.4%), and inadvertently taking or administering the same medication twice (15.7%). Of the patients that reported missing a dose, 8% specified that they had experienced an adverse event. These adverse events were more common in patients that managed multiple oral medications. Nearly half of those that reported adverse reactions stated that organizing medications was bothersome. Hodges et al. reported that medical outcomes most commonly associated with adverse reactions were of moderate effect (93.5%), followed by major effect (5.8%) and death (0.6%).

Conclusion: Conclusion (200 words):

Medication management is a complex process that requires the patient to understand how to organize and administer medications correctly. There are a growing number of acute and chronic conditions that require multiple pharmaceutical therapies. Medication mismanagement is a factor in medication errors and can result in adverse reactions. Measures are needed to provide adults and caregivers with the necessary tools to minimize medication errors and adverse reactions attributable to medication mismanagement.

Improved patient education, new technologies, and delivery of medication organization systems are immediate opportunities to potentially reduce the risk of medication errors in polypharmacy adults.

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Session-Board # - 7-121

Poster Title: Identifying the use of ambulatory pharmaceutical pumps by hospitalized patients: implementation of electronic pharmacist notification triggered by nursing admission assessment

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Safety concerns surrounding the management of ambulatory pharmaceutical pumps for hospitalized patients are well-documented. At our facility, case investigations of safety events demonstrated a lack of documentation of medications administered through ambulatory pharmaceutical pumps for hospitalized patients. In order to minimize the potential for duplicative prescribing due to insufficient documentation, the hospital's medication use safety improvement committee sought a process to identify and document medications administered through ambulatory pharmaceutical pumps in real time. This poster describes the methods by which identification and documentation of ambulatory pharmaceutical pump medications are now achieved upon admission, and the outcomes of the intervention.

Methods: Safety concerns surrounding inadequate documentation of medications administered via ambulatory pharmaceutical pumps were presented to the hospital's medication use safety improvement committee for review. In the initial discovery phase, committee investigators learned of a standard assessment point concerning medical devices in the nursing admission workflow. This assessment point requires nursing documentation of medical devices including pharmaceutical pumps upon admission; however, the data is not easily accessible by other healthcare disciplines within the medical record. Pharmacy team members proposed utilizing this nursing assessment to allow for pharmacist review and follow up documentation via the electronic medical record's messaging system. The informatics team used the population of the pharmaceutical pump field of the nursing assessment as a trigger to generate a real-time message that populates to the order verification pharmacist's work queue. Upon receipt of this message, pharmacists review the patient's medical record and obtains the

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necessary information to subsequently profile the pharmaceutical pump medication in the electronic medication lists and medication administration record.

Results: The pharmaceutical pump messaging system was implemented successfully on May 9, 2017. A retrospective review of profiled pharmaceutical pump records was conducted for the six months prior and the six months following messaging system implementation. For the study period prior to implementation, a total of 13 ambulatory pharmaceutical pump medications were profiled for hospitalized inpatients; of these, 11 involved insulin and 2 involved opiates or other pain medications. For the study period after implementation, a total of 29 ambulatory pharmaceutical pump medications were profiled for hospitalized inpatients; of these, 12 involved insulin, 14 involved opiates or other pain medications, 2 involved chemotherapy, and 1 involved antibiotics.

Conclusion: Leveraging nursing admission assessment points to generate real-time messaging to pharmacy allowed pharmacists to identify medications administered via ambulatory pharmaceutical pumps for hospitalized patients. This led to increased documentation for an array of pharmaceutical pump medications in the medication profile. The inclusion of the pharmaceutical pump medication in the medication profile allows for a more complete prospective medication review for prescribers and pharmacists; this may mitigate some safety concerns surrounding pharmaceutical pump medications in hospitalized patients by reducing the probability of duplicative prescribing.

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Session-Board # - 7-122

Poster Title: Analysis of the represcription rate and adverse drug reactions (ADR) recurrence rate of previously ADR-reported drugs, after changing 'criteria of ADR warning sign'

Poster Type: Descriptive Report

Submission Category: Safety / Quality

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Purpose: Reducing the represcription of the adverse drug reactions (ADR)-reported drugs and those of which consisted of the same components can improve the safety of drug use. In Ajou University Hospital order communication system (OCS), ADR warning sign appears when doctors represcribing ADR-reported drugs. The hospital changed the ADR warning criteria severity level from 3 to 2 in the second quarter of 2016 when represcribing ADR-reported drugs. In this study, we analyzed the represcription rate and recurrence rate of ADR-reported drugs quarterly for 18 months after the change, and investigated the following effect on the represcription rate and recurrence rate.

Methods: The subjects of this study were total 13,554 ADR-reported patients; admissions or out patients who visited Ajou University Hospital from September 2016 to February 2018. The represcription rate was analyzed quarterly for 18 months using the number of patients who were represcribed drugs that were belong to the same anatomical therapeutic chemical classification system code (ATCCode) group as the ADR-reported drugs. The recurrence rate of ADR was analyzed by retrospective study based on electronic medical records (EMR). The ADR represcription rate was calculated by dividing the number of patients who were represcribed the ADR-reported drugs by the number of patients with ADR-reported history admitted to the hospital during the corresponding quarter. The recurrence rate of ADR was calculated by dividing the number of patients who had recurrence of ADR by the number of patients who were represcribed ADR-reported drugs for the corresponding quarter. Drugs were classified according to which organs they acted on and the frequencies of represcription were determined by classified groups.

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Results: After strengthening ADR warning criteria, the represcription rate decreased from 7.70% to 4.63%, and the ADR recurrence rate was 6.68% on a quarterly average. Among the 140 patients with recurrent ADR, 127 (90.7%) patients had 'Not serious' ADR and 13 (9.3%) patients had 'Serious' ADR. Only 2 out of 13 patients with serious recurrence ADR had been reported as having serious symptoms in the first ADR report and the others had been reported as 'Not serious'. Out of 185 patients represcribed of ADR-reported drugs for more than 6 months, 180 (97.3%) patients did not show ADR symptoms again. The most common recurrence symptoms of ADR were gastrointestinal ADR (e.g. nausea, heartburn, 56 cases, 35.2%) and followed by dermatological ADR (e.g. itching, urticaria, 44 cases, 27.7%). Among the recurrent symptoms with high severity, gastrointestinal ADR (4 cases, 19.04%) and systemic ADR (e.g. anaphylactic shock, 4 cases, 19.04%) were the most common. Tramadol was the most commonly represcribed drug with the highest number of ADR recurrence (35 cases) while dermatological drugs showed the highest recurrence rate (33.0%).

Conclusion: Represcription rate of ADR-reported drugs decreased after the change of ADR warning criteria and ADR recurrence rate also decreased. The interpretation upon the severity of the recurrence symptom stresses the need to closely observe the ADR-reported patient regardless of the ADR severity of the previous assessment. The recurrence rate of each drug was not necessarily proportional to the frequency of represcription. In addition, it is necessary to manage the causality between ADR-reported drugs and first reported ADR symptoms of patients who had been prescribed ADR-reported drugs for more than 6 months but did not have recurrence of ADR symptoms anymore.

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Session-Board # - 7-123

Poster Title: High-risk opioid prescribing when multiple prescribers are involved

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: The Centers for Disease Control (CDC) Guideline for Prescribing Opioids for Chronic Pain addresses avoiding co-prescribing of opioids with benzodiazepines or central nervous system depressants as these combinations are likely to increase the risk of opioid-associated overdose. The purpose of this project was to quantify the number of Idaho patients receiving opioids for chronic pain who also received an overlapping prescription for a benzodiazepine or CNS depressant involving more than one prescriber. In addition, to compare the frequency of these high-risk opioid combinations being prescribed when only one prescriber is involved versus more than one prescriber.

Methods: The institutional review board approved this cross-sectional observational study. All controlled substances reported to the Idaho Prescription Drug Monitoring Program (PDMP) from January to December 2017 were included. Patient and provider names were de-identified but given unique identifiers to allow for stratification by individual patient and provider. All patients who filled an opioid prescription for greater than a 90 day time period, with no greater than a 7 day break, were categorized as chronic opioid users. This is consistent with the CDC guideline definition of long-term opioid use. An opioid was defined as any opioid or opioid containing product. The chronic opioid users were then evaluated for having received an overlapping benzodiazepine or CNS depressant prescription at any time during the study period. A benzodiazepine was defined as a benzodiazepine or any benzodiazepine containing product with the exception of rectally administered diazepam. A CNS depressant was defined as any product containing a barbiturate, sodium oxybate, chloral hydrate or scheduled non-

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benzodiazepine hypnotic. Butalbital and butalbital containing products were excluded from this category. All medications were sorted into their categories by NDC number. Those identified as having overlapping opioid-benzodiazepine or opioid-CNS depressant combinations were further assessed for involvement by greater than one prescriber.

Results: Of the 301,975 patients in Idaho that filled a controlled substance in 2017, there were 100,916 (33 percent) patients that met the criteria for being a chronic opioid user. Of the chronic opioid users, 24,520 (24 percent) were also prescribed a benzodiazepine or other CNS depressant in the same year. Of this population, 10,789 (44 percent) had more than one prescriber involved in the high-risk combination(s).

Conclusion: One in four chronic opioid users received a high-risk opioid combination. Forty four percent of patients received these combinations when more than one prescriber was involved. Given the limited view of the data, it is unclear if prescribers of these combinations checked the PDMP before prescribing. However, given the inconsistent use of the PDMP, it is possible that many of these combinations were unintentional. Since Idaho requires a pharmacist to register with the PDMP, pharmacists have many opportunities to facilitate communication between these prescribers. These results suggest that continued education on appropriate opioid prescribing is warranted.

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Session-Board # - 7-124

Poster Title: Pilot studies of safe handling and disposal of oral anticancer chemotherapy

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: Regimens using oral anticancer chemotherapy (OC) provide the convenience for self-medication at home but can increase the risk of exposure to the household. OC are perceived as less toxic than intravenous chemotherapy, potentially leading to suboptimal education and insufficient guidance for safe handling and disposal. The purpose of this pilot study is to conduct 2 surveys targeting the healthcare providers and patient/caregivers to assess their knowledge/awareness, practice, and attitudes to identify gaps and potential barriers for safe handling and disposal of OC. The secondary objective aims to evaluate the survey questions clarity and feasibility of the survey delivery.

Methods: Provider:

A 37-item survey was developed through literature reviews of current guidelines, recommendations, and state/federal laws. Selected items (N = 23) relating to the handling and disposal of OC were assessed quantitatively on providers' knowledge. Additional items were added specifically for pharmacists (N = 3) and nurses (N = 4).

Patient/Caregivers:

An IRB-approved patient/caregiver 36-item survey was conducted at a single oncology site, also assessing knowledge and practices relating to OC. Patients were identified by the practice site. Patients had to be 18 or older, currently self-administering OC or having done so in the last 12 months, and able to complete the survey in English alone or with assistance. The patient survey included an additional 6 qualitative feedback items. The quantitative portion (N = 24) of both surveys were broken into subsections including: handling of OC, storage of OC in the home, physical manipulation of OC, handling of waste and clothing, disposal of OC, and

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safety/exposure of OC. Fourteen items were deemed critical (i.e. expected score of 100%), based upon their implications in patient safety and the presence of these topics in guidelines/package inserts.

Statistics:

Descriptive analyses were used to assess subject's knowledge, awareness, and practice in handling and disposal of OC. The comprehensibility and the delivery mechanism of the survey were also evaluated in the pilot study based on subjects' feedback.

Results: A total of 15 providers, from 4 disciplines, mostly from ambulatory care with over 10 years of experience, completed the survey from multiple medical practices across California. Overall, the average correct response was 65% (15/23). Only 2 out of 14 critical items reached 100%. The section with the highest accurate response was "physical manipulation" (97%) and the lowest pertained to "storage of OC in the home" (46%). "Insufficient training" and "insufficient time" were the most commonly reported barriers in patient education.

Pharmacists were recognized as the primary provider of this information (10/15).

A total of 12 patients participated. Majority of patients were between 50-64 years of age (N = 5), completed high school (N = 7) and were Caucasian (N = 8). Both genders were equally represented. The average correct response was 65% (15/23). Three out of 14 critical questions were answered at 100%, regarding the topics of "physical manipulation of OC" and "handling body waste." The highest average section pertained to the "physical manipulation of OC" (100%), with the lowest average scored section being "storage of OC in the home" (50%). 10 out of 14 critical questions were answered with less than a 79% accuracy.

Conclusion: The data indicated that the knowledge, awareness, and practice of the providers are suboptimal. Patient's knowledge about OC is also suboptimal. There is an overall lack in knowledge and awareness among providers and patients in the safe handling and disposal of OC. The provider survey data demonstrated the need for more educational training and supportive resources in safe handling and disposal of OC. The survey works well overall but minor revisions are needed for 3 items due to ambiguity in the question. The feasibility of online delivery method could not be evaluated in either study.

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Session-Board # - 7-126

Poster Title: Incorrect updates in the shared medication profile when patients are discharged from hospital

Poster Type: Evaluative Study

Submission Category: Safety / Quality

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Purpose: The Shared Medication Profile (FMK) is a national electronic healthcare service in Denmark. The purpose of FMK is to provide an updated overview of the current medication treatment of the individual patient, and thereby preventing medication errors. Collaborators in primary health care experience, that the update of FMK is incomplete after discharge from Odense University Hospital (OUH).

The purpose of this study was to assess the amount of incorrect FMK updates when patients are discharged from OUH.

Methods: A journal audit was made after approval by the committee of quality and patient safety on OUH.

The audit was performed by reviewing patient journals and FMK for patients discharged the 15th of March 2018, and who had been hospitalized for at least 24 hours.

The discharging doctor has the responsibility to update FMK, and prescribe new prescriptions for the patient. When the update of FMK is accomplished, the doctor has to mark this by pressing the button "Update FMK". This button can be pressed though without any updates being done beforehand.

The pharmaconomists at OUH offer to compose a list of the patient's usual medical treatment just before being hospitalized. This list is made to create an overview and as a service to the doctors.

In this study it was assessed if the update of FMK was subject to one or more of the following four discrepancies: 1. difference of clinical meaning between the medicine list in the patient's journal and the medicine list in FMK after discharge, 2. outdated medicine in the medicine list in

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FMK, 3. difference between the medicine in the medicine list in FMK and the patient's prescriptions, 4. lack of new prescriptions and/or insufficient updating of existing prescriptions.

Results: In total 203 patients were screened for inclusion. Of these, 53 were excluded as they died before discharge, were cohospitalized relatives, were transferred to another hospital/department or had a clinical pharmacist to assess their medicine list before discharge. The remaining 150 patients were included. Of these 101 (67 percent) of the patients were discharged from a medical department, and 49 (33 percent) of the patients were discharged from a department of surgery.

For 127 (85 percent) of the patients the FMK was marked as updated. It was observed that 67 out of 141 patients (48 percent) had a FMK with one or more discrepancies at discharge. Nine cases were excluded as it was not evident whether there were discrepancies or not. There was no significant difference between the amount of marked FMK updates whether the patients were discharged from a department of medicine or surgery ($p=0.814$).

There was no significant difference between the amount of discrepancies whether FMK was marked updated or not ($p=0.780$), if the patients were discharged from a department of medicine or surgery ($p=0.920$) or the pharmacist had made an updated medicine list ($p=0.746$).

Conclusion: This study shows that for most patients the doctors mark, that they have updated FMK at discharge.

Nevertheless almost half of the patients had a FMK with one or more discrepancies at discharge. It was thereby indicated, that FMK was considered as updated even though this update was incorrect. This can potentially lead to unintended events and medication errors and hereby have consequences for patient safety. It is recommended that the hospital continues to focus on this issue.

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Session-Board # - 7-127

Poster Title: Implementation of an antibiotic order set to improve indication documentation in a pediatric behavioral health facility

Poster Type: Evaluative Study

Submission Category: Small and/or Rural Practice

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Purpose: Antibiotic Stewardship promotes the appropriate use of antibiotics by promoting the optimal agent, dose, duration, and route of administration (ROA) in order to improve patient outcomes, while minimizing toxicity and the emergence of antibiotic resistance. Small behavioral health hospitals pose unique challenges to implementation of antimicrobial stewardship programs which can include lack of information technology advancements, such as electronic medical records or computerized-physician order entry. The purpose of this study was to assess the impact of an oral antibiotic order set on indication documentation within a pediatric behavioral health facility.

Methods: This was a single center, retrospective cohort within a 55-bed pediatric behavioral health facility assessing documentation of antibiotic indication on orders 6 months before and 6 months after implementation of an oral antibiotic order set. The hospital's Antimicrobial Stewardship Committee developed and implemented an order set consisting of all formulary antibiotics, as well as a location for documentation of antibiotic dose, indication and duration. Prior to implementation, the pharmacists performed chart review to obtain order indication when it was not present within the order. A monthly report was created to monitor the documentation of indication for all patients who received an antibiotic. The primary outcome included evaluation of antibiotic indication documentation for all antibiotic orders. Secondary outcomes included assessment of documented dose and duration. A Fisher's exact test was utilized to assess primary and secondary outcomes with an alpha level equal to 0.05.

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Results: There were 52 antibiotic orders in the pre-intervention group and 48 antibiotic orders in the post-intervention group. Documentation for antibiotic orders significantly increased post-implementation for indication [45 of 48 orders (94 percent) versus 41 of 52 orders (79 percent), p equals 0.043]; however, no difference was observed for dose documentation [48 of 48 orders (100 percent) versus 51 of 52 orders (98 percent), p equals 1] or duration documentation [47 of 48 orders (98 percent) versus 47 of 52 orders (90 percent), p equals 0.207].

Conclusion: Implementing an antibiotic order set resulted in increased documentation of antibiotic indication. No significant difference was observed in documentation of dose or duration; however, both had greater than or equal to 90 percent compliance pre-intervention.

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Session-Board # - 7-128

Poster Title: Effect of initiation of benznidazole on tacrolimus levels post-heart transplant

Poster Type: Case Report

Submission Category: Transplant / Immunology

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Purpose: Chagas disease is a cause of cardiomyopathy for many patients in Central America, South America, and Mexico; up to 300,000 United States residents are estimated to have Chagas disease. Orthotopic heart transplantation (OHT) is the treatment for chronic Chagas cardiomyopathy with end-stage heart failure. Monitoring for reactivation of the disease after transplantation is critical, and treatment with antitrypanosomals is indicated when it occurs. Little information is available regarding the use of antitrypanosomals in combination with immunosuppressants typically used in the United States. We sought to determine the effect of benznidazole agents on tacrolimus levels post-transplant.

We identified two patients with Chagas disease prior to heart transplant. Patients were treated post-transplant with standard medications. Both patients were screened for reactivation of *Trypanosoma cruzi* with weekly PCR and buffy coat for three months post-transplant. Patients were treated with benznidazole obtained through the CDC when PCR or buffy coat was positive. Records were reviewed for dose changes, tacrolimus levels, and side effects during and after initiation of benznidazole.

Patient 1 is a 47 y.o. male from El Salvador. He received OHT and was discharged on POD 14 with tacrolimus dose of 4 mg PO every 12 hours as well as other standard medications. Within 2 weeks post-transplant, buffy coat became positive for *T. cruzi*. The patient was prescribed benznidazole approximately 5 mg/kg/day divided every 12 hours. Due to the possible drug interaction, the tacrolimus dose was decreased to 2 mg every 12 hours. The next tacrolimus trough was 9.1 ng/ml, so tacrolimus was increased to 3 mg PO every 12 hours. The subsequent

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trough was 11.5 (goal 12-15 ng/ml). The patient did not report any side effects from benznidazole.

Patient 2 is a 56 y.o. male from El Salvador. He received OHT and was discharged on post-operative day 8 with tacrolimus dose of 4 mg PO every 12 hours as well as other standard medications. Chagas PCR and buffy coat became positive within 3 weeks post-OHT.

Benznidazole was initiated at a dose of approximately 5 mg/kg/day divided every 12 hours. Tacrolimus was decreased to 3 mg PO every 12 hours. Trough level after this decrease was 15.7 ng/ml, so tacrolimus was reduced to 3 mg qAM and 2 mg qPM and subsequent trough was 14.9 (goal 12-15 ng/ml). The patient reported fatigue and mild itching on his neck during treatment with benznidazole.

Initiation of benznidazole for Chagas disease reactivation required a 25-37.5% reduction of the tacrolimus dose in post-heart transplant patients. Careful monitoring of tacrolimus levels is required when initiating benznidazole therapy.