

ASHP 2019 Summer Meetings Poster Abstracts

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

Poster Type: Descriptive Report

Session-Board Number: 1-M

Poster Title: Financial impact of drug shortages at an academic medical center

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Purpose: Drug shortages are a major problem that affect nearly every health care organization. The purpose of this study was to assess the financial impact of select controlled substances and intravenous (IV) fluid drug shortages at an academic medical center. The secondary outcome of this study investigated the financial impact of drug shortages management as calculated by considering the time spent by pharmacy leaders managing drug shortages and overtime paid to technicians.

Methods: This retrospective, single center study included select controlled substance and IV fluid shortages in the assessment. The primary outcome measured the change in inpatient aggregate drug purchases before, during, and after Baxter, Pfizer, and PharMEDium shortages at an academic medical center. Purchase history data collected ranged from October 1, 2016, to October 31, 2018. The timeframes varied based on when each shortage (Baxter, Pfizer, PharMEDium) occurred. The primary outcome was achieved by analyzing purchase history data from the institution's group purchasing organization (GPO), inventory management system, and direct non-GPO purchase data. In order to fully account for financial impact, aggregate purchase history was collected for included medications on shortage as well as those used to substitute shortage medications.

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Secondary outcomes investigated the financial impact of drug shortage management. Secondary outcomes were achieved by calculating associated labor costs of employees' time allocation for procurement, operational changes, shortage meetings, and time spent on electronic medical record maintenance. An electronic survey intended to measure time allocation associated with shortage management was disseminated to pharmacy leaders representing clinical and operational services, electronic medical record maintenance, automation, and supply chain. The survey was disseminated to 20 pharmacy leaders, comprised of 14 pharmacists and 6 non-pharmacists. The non-pharmacists included pharmacy technician supervisors and purchasing agents. Time allocation results of the survey questions were totaled and annualized.

Results: The results for the primary outcome varied among the three drug shortages studied. Average monthly drug spend on opioids related to the Pfizer drug shortage more than doubled. Average monthly drug spend on fluids remained constant before, during, and after the Baxter drug shortage. Average monthly drug spend on opioids related to the PharMEDium drug shortage decreased approximately 75% due to little to no product available for purchase.

Ten survey responses were received for an overall response rate of 50%. The average survey responder reported an additional 3.9 hours on drug shortage related meetings and calls per week, 2.4 hours on emails, 1.5 hours on maintaining and updating shortage-related documents, and 1.9 hours on electronic medical record maintenance. In total, pharmacy leaders who responded to the survey spent an average of 9.7 hours per week on top of regular routine responsibilities. This demonstrates significant opportunity cost and lost productivity for the institution. Additionally, multiple survey responders reported using technician overtime throughout this time period in varying degrees in order to manage drug shortages, demonstrating tangible personnel budget impact.

Conclusion: Drug shortages have had a major impact on an academic medical center. The financial impact of drug shortages varies based on the drug shortage source and alternative products available and purchased. Three types of drug shortages studied showed variations of increasing spend, decreasing spend, and no change in spend. Technician overtime impacts the salary budget of the department of pharmacy. Pharmacy leaders spent approximately one-quarter of the work week managing drug shortages.

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

Poster Type: Evaluative Study

Session-Board Number: 2-M

Poster Title: Utilization and cost evaluation of botulinum toxins in chronic migraine prophylaxis at Veterans Affairs San Diego Healthcare System

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Purpose: Veterans are a special population and our clinical services strive to provide the best care using resources available. Past studies have shown improved outcomes for patients with chronic migraines who use Botulinum toxins vs placebo. However, as a facility we are not meeting our goal for the expenditure of Botulinum toxins and one of the goals of the pharmacy service is to find ways to decrease spending for this class of drugs without compromising care for our Veterans. The purpose of this study is to analyze the utilization and cost of Botulinum toxins used in patients for chronic migraine prophylaxis.

Methods: This is a retrospective electronic database study that identifies utilization and cost of Botulinum toxins in patients for chronic migraine prophylaxis. Data collected includes the patients currently on Botulinum toxin medications (Botox 200U, Botox 100U, Xeomin 100U, and Xeomin 50U) with chronic migraine diagnosis/indication who have been administered at least 1 dose of Botox and are at least 18 years old or older. This included patients who sought treatment from the VA San Diego from 12/31/17- 12/31/2018. Patients were excluded if they had a hypersensitivity to botulinum toxins or any components in the formulation (human serum albumin, lactose, sucrose, disodium succinate), if they had an indication for use of Botulinum toxins is a for a cosmetic purpose, co-administration with neuromuscular blockade, or if patient

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is pregnant because botulinum toxin is risk category C. Outcomes analyzing efficacy are use of abortive therapy, migraine-free days, and time between botulinum toxin injections. Outcomes analyzing safety were adverse reactions and emergency department visits. Per chart review, included how much if each Botulinum toxin product was being used, duration of therapy, patient reported incidents of migraines post injections to compare at baseline, and patients' use of third line therapies (Anti-hypertensive, antiepileptics, opioids, cyproheptadine). Cost per number needed to treat analysis assessed the efficacy of the use of botulinum toxin in chronic migraine prophylaxis.

Results: VISN 22 is a region that contains numerous facilities within the California, Arizona, and New Mexico areas. VISN 22's goal for all facilities was to spend a total of ~\$15,000 per quarter for Botulinum toxin products. This goal is based on reducing the total cost spent per 10,000 patients. The VA San Diego Healthcare System facility spent ~\$160,000 on these products and is therefore, not at goal. VASD currently has 46,049 unique patients using Botulinum toxin products with ~117 of those patients using it chronic migraine prophylaxis. Prescribing trends may have changed due to recent National Criteria for Use (CFU) in October 2018. CFU are national guidelines that guide providers for Non-Formulary or Prior Authorization-type medications.

Conclusion: Botulinum toxin products are over utilized and therefore driving costs up. Strategies to improve cost effectiveness includes considering duration of action when selecting a new agent, provider education on differences in dosing/indication/injection techniques, and encouragement to use the most cost-effective agent for new starts.

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

Poster Type: Evaluative Study

Session-Board Number: 3-M

Poster Title: Nebes to Beds project: Auto-substitution of metered-dose and dry powder inhalers to nebulization therapy in a community health-system

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Purpose: The purpose of this study is to evaluate the financial and clinical opportunities for the adoption of a nebulizer-based formulary in place of metered-dose inhalers (MDIs) and dry powder inhalers (DPIs) using a pharmacy protocol for therapeutic substitution of inhalers to an appropriate dose of nebulized medication. Decentralized inpatient and outpatient pharmacists at each acute care location will mitigate the risk of nebulized therapy initiated during admission being inappropriately prescribed at discharge. Additionally, our outpatient pharmacies provide bedside delivery of medications prescribed at discharge ensuring patient access to prescribed therapy. These were important considerations taken in the decision to initiate.

Methods: A retrospective utilization review of all the purchased inhaled medications, including both nebulized forms and inhalers, was conducted. The organizational inhaler expenditure was calculated and a cost inflation rate prediction based on available resources was applied to generate projected costs over the next several years. A detailed cost benefit analysis (CBA) was developed based on these data. The CBA focused on the total non-recurrent costs, recurrent costs, cost savings, and cost benefits projected for the next five fiscal years. This information was used as the foundation for launching the pilot "Nebes to Beds" program at one of the adult acute care hospitals.

Results: This initiative has been implemented in the emergency departments (ED) of two of four adult hospitals using a MDI Inhaler Therapeutic Interchange protocol. The initial results are

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encouraging as they showed a significant reduction in cost, missing medication messages, and scheduled doses of MDIs and DPIs not given in the ED. A sixty day pilot is being initiated for hospital-wide implementation at one location with subsequent extension to all four adult acute care hospitals in the health system.

Conclusion: Auto-substitution of MDIs and DPIs to nebulization therapy in a health-system has the potential to significantly reduce inpatient drug expenditures, lessen pharmaceutical waste, and decrease pharmacy and nursing labor in response to missing inhaler messages while providing quality respiratory therapy to patients.

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

Poster Type: Descriptive Report

Session-Board Number: 4-M

Poster Title: Implementation of an anticipatory workload tool for inventory procurement roles within in a large pediatric medical center

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Purpose: The pharmacy department utilizes internal workload tools for operational and clinical services. Workload tools enable pharmacy leadership to assess workload and validate the need for resource justification. However, such tools have limited utility with assessing the pharmacy inventory procurement team. This team has an integral role in the medication use system with an impact on patient care. A literature review determined the lack of published workload tools for non-traditional roles. The purpose of this initiative is to develop an anticipatory workload tool for pharmacy leadership to assess staffing needs of the pharmacy inventory procurement team and assist with resource justification.

Methods: There was a 4-phased approach to developing a functional workload tool. The 4 phases include observation, data accumulation, data analysis, and tool implementation. The anticipatory workload tool was developed from July 2018 – December 2018. An internal business process improvement specialist completed an observational analysis of the inventory team's workflow. Tasks observed included receiving, unloading, sorting, and transporting medications and supplies. The specialist also observed functions including requisition fulfilling, arranging courier services, and ordering medications along with drug shortage and out-of-stock management. Data accumulated included the average number of wholesaler line items per day, number of prescriptions and inpatient orders, number of out-of-stock items, hours worked, overtime hours, number of stock order requests, volume of courier calls, and the number of

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purchases not from the primary wholesaler. Variables excluded from the analysis included pharmacy dollars spent and number of totes received from wholesaler. Descriptive statistics were used to analyze the data.

Results: Based on observations and data analyses, it was determined that the average number of daily wholesaler line items is a strong indicator to assess workload of the pharmacy inventory procurement team. Other indicators were deemed valuable and worth including in the anticipatory workload tool. Such indicators included hours worked, overtime hours, items ordered but out of stock, and order volumes from each pharmacy.

Conclusion: An anticipatory workload tool was successfully created and implemented within the pharmacy department. This tool can be used by pharmacy leadership to anticipate staffing needs of the pharmacy inventory procurement team and assist with resource justification.

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

Poster Type: Evaluative Study

Session-Board Number: 5-M

Poster Title: Evaluating the impact of standardizing a health-system enterprise formulary

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Purpose: NewYork-Presbyterian (NYP) is a health-system originally comprising of six hospitals that recently expanded to a ten site enterprise across New York City and surrounding areas. Upon expansion, separate formularies were maintained on disparate electronic medical record (EMR) programs. NYP moved to consolidate to one formulary to allow for convergence to a single EMR, standardize care, improve patient safety, increase efficiency, optimize inventory management, and reduce costs. The purpose of this project is to quantify efficiencies in formulary management including projected annual cost-savings from formulary consolidation, and reduction of redundancies to improve efficiency and quality of care.

Methods: The pre-consolidation formularies across sites were compared to the post-consolidation single Enterprise Formulary. Drug purchase reports with the total drug expenditures for 2018 were reviewed for each hospital for the medications deleted from Formulary. Basic descriptive statistical tests were performed. The number of medications and number of dosage forms were compared across sites. Projections on cost-savings were based on historical purchasing data using the pre-consolidation Formulary compared to the Enterprise Formulary. The impact of standardizing enterprise medication-use policies for select high cost drugs was also evaluated. Finally, cost-savings due to avoidance of carrying costs were estimated.

Results: Five formularies were condensed into a single Enterprise Formulary. Most medications (84.7%) were already on the majority of hospital formularies and therefore remained on the

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Enterprise Formulary. However, 13.6% were on a minority of hospital formularies, and were elected by the Enterprise Formulary and Therapeutics Committee to not be added to the Enterprise Formulary. The remaining 1.7% of medications were added to the Enterprise Formulary despite being on the minority of hospital formularies. After Enterprise Formulary and Therapeutics Committee review, a total of 206 medications were recommended for deletion, and the number of drugs inclusive of varying dosage forms on Formulary were reduced by 43.8%, from 5,400 to 3,037. Adherence to the new NYP Enterprise Formulary will result in a projected annual cost-savings of \$1.7 million across all hospital sites. Additionally, an estimated \$192,000 will be avoided in carrying costs of the deleted formulary medications. Lastly, as part of the formulary standardization process, restrictions for high cost anti-neoplastic agents were standardized resulting in a projected cost-savings of \$1.1 million.

Conclusion: Standardizing to one Enterprise Formulary results in significant cost-savings for the NYP Enterprise. The standardization of an Enterprise Formulary allows for the same high level of care to be implemented across all sites. Medications and dosage forms rarely used or used only in a minority of hospitals were removed, reducing costs and allowing for improved contracting opportunities. Cost-savings is also expected through avoiding carrying costs of non-formulary medications. Formulary consolidation resulted in the removal of several redundancies in pharmacy inventory, drug utilization, purchasing agreements, and EMR maintenance.

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

Poster Type: Evaluative Study

Session-Board Number: 6-M

Poster Title: Impact of a clinic embedded medication assistance program specialist on completion of prior authorizations

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Purpose: A prior authorization (PA) is utilized by payers in efforts to direct proper use of medications and designation of resources. This process can be time-consuming for providers, patients and the pharmacy. In order to provide structured support navigating medication access, a Medication Assistance Program (MAP) specialist was embedded in the adult pulmonary clinic. The purpose of this study is to assess the impact of the embedded MAP specialist on the prescription benefit PA process and provider satisfaction in a pilot clinic. The primary aims of this study are to assess time to PA approval, PA approval rate, and provider satisfaction.

Methods: Prior to implementing a MAP specialist in the clinic, the PA process was handled by any available clinic staff, including the physicians, clinical pharmacist practitioner, nurses, and medical assistants, who would work on the process during available downtime. The MAP specialist position was designed to be an advanced pharmacy technician role requiring a certified pharmacy technician specifically trained in billing, prior authorization entry, and financial assistance. The MAP specialist was present in the clinic and had access to the shared EHR. The MAP specialist documented each step of the PA process starting with a referral entry indicating the need for a PA (once notified by the patient or the pharmacy), through the time of approval or denial from the insurance company. Time from referral creation to approval or final denial was recorded as turnaround time. A survey was sent to providers in the clinic prior to the

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MAP specialist starting to assess provider satisfaction and perceptions around the prescription benefit PA process. A follow-up survey was sent to providers after the MAP specialist had been working for 4 months. Mann-Whitney U tests were used to analyze change in provider satisfaction, and descriptive statistics were used to report PA turnaround time and approval rates.

Results: The MAP specialist completed 110 PAs from June 1, 2018 through August 31, 2018. The payer mix was 40% commercial and 60% government. PA turnaround time varied widely, with a range from six minutes to 20 days. Median turnaround time to PA decision was 3 hours, with 80 percent of PAs approved in less than 4 hours. Initial approval rate was 82.7 percent, and overall approval rate following the appeals process was 87.3 percent. A total of 15 providers responded to the pre-MAP survey, and a total of 9 providers responded to the post-MAP survey with a majority being physicians with 1-5 years of experience. Although the survey was sent to the same group of providers for both the pre- and post-survey, different providers chose to respond. A significant difference between the pre- and post-survey was identified in 2 of the 17 questions. Question 8 assessed the physician perception of whether “When prior authorizations are appealed, the appeals are approved,” with significantly more agreement in the post-survey ($p=0.0183$). Question 15 asked for agreement with the statement “The system in place for completing prior authorizations is effective” and showed significantly stronger agreement after the MAP specialist workflow was implemented ($p=0.0200$).

Conclusion: Implementation of a clinic embedded MAP specialist to complete PAs demonstrated an efficient process while also improving provider satisfaction. Having the MAP specialist located on-site in clinic allows for direct coordination of care amongst the providers, patient and pharmacy, ensuring timely and affordable medication access. Utilizing certified pharmacy technicians in the role of a MAP specialist allows them to practice at the top of their license, which is in alignment with calls for advancing roles of technicians and utilizing novel workflow to free up pharmacist and provider time for direct patient care and clinical activities.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 7-M

Poster Title: Clinical pharmacists' interventions using a standardized comprehensive medication management process in an ambulatory care setting

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Purpose: Clinical pharmacists practicing in ambulatory care clinics make medication-related interventions and can improve clinical outcomes in such chronic disease states as diabetes and hypertension. While there is increasing data showing pharmacists improve clinical outcomes, the methods for obtaining those results remain less clear. At our institution, no standard method existed for ambulatory care pharmacists to document interventions. This made it difficult to track pharmacist productivity, extract data, and confirm pharmacists' value to the healthcare system. The purpose of this study is to record interventions made by utilizing a recently introduced tracking form within the electronic medical record.

Methods: A standardized tracking form to document pharmacist interventions was developed within the electronic medical record. Pharmacists completed the form at the end of every patient encounter and selected specific interventions on the form based on the Pharmacy Quality Alliance (PQA) Medication Therapy Problem (MTP) Categories Framework. This study was designed to examine the quantity and quality of data collected by a sample of 4 pharmacists who utilized the tracking form during a pilot period to record patient specific MTPs and interventions. All tracking forms for patients greater than or equal to 18 years of age who were contacted by a clinical pharmacist between October 1, 2018 and January 31, 2019 were identified using our institution's electronic data warehouse. The tracking form data were extracted, analyzed, and reported. The primary outcome of this study was to quantify the number and type of MTPs identified and interventions recommended among the study patients. Secondary outcomes included blood pressure reduction, percentage of patients with

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hypertension with a blood pressure of less than 130/80 mmHg, hemoglobin A1c reduction, percentage of patients at hemoglobin A1c less than 8 percent, proportion of patients with diabetes on statin therapy, and the percent of patients with albuminuria on angiotensin converting enzyme inhibitors (ACEi) or angiotensin II receptor blocker (ARB) therapy.

Results: Tracking forms were completed for 564 encounters representing 351 unique patients during the study period. Among the 4 pharmacists included in the study, 435 MTPs were identified, and 1,139 interventions were made or recommended. There were 2.03 interventions per encounter and 29.3 minutes was spent per encounter. The most frequent medication therapy problems identified were ineffective medication therapy, missing information in the medical record, and indication for medication without treatment. The most common interventions logged were adjusting medication dose or frequency, providing medication education, and recommending immunizations. Systolic blood pressure reduced from pre-trial median of 138 mmHg to 132 mmHg (P equals 0.01) and diastolic reduced from 78 mmHg to 74 mmHg (P equals 0.038). The percentage of patients with a blood pressure of less than 130/80 mmHg increased from 19 percent to 36 percent (P equals 0.008). Median hemoglobin A1c reduced from 8.7 percent pre-trial to 8.6 percent (P equals 0.203) and the percentage of patients with a hemoglobin A1c less than 8 percent increased from 27 percent to 35 percent (P equals 0.152). The percentage of patients with diabetes on statin therapy was 75.2 percent and 71.7 percent of patients with albuminuria were on ACEi or ARB treatment.

Conclusion: These data confirm the intervention tracking tool is a plausible and valid way to record pharmacist interventions. Full-scale implementation may lead to a formalized way to improve data and metric collection, pharmacist productivity, and validation that ambulatory care pharmacists add value to the healthcare system. Based on the results of this study, future research will be conducted to analyze the impact on hospital readmission rates and evaluate the total cost savings ambulatory care pharmacists' bring to the healthcare system.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 8-M

Poster Title: Effects of implementation of a pharmacist-managed Hepatitis C clinic

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Purpose: An estimated 2.4 million Americans are currently living with the Hepatitis C Virus (HCV). Treatment options carry a >90% cure rate but can cost from \$26,000 to \$80,000+ per treatment course. Because of these costs, close laboratory monitoring, and risks with lack of adherence; HCV medications are generally filled by specialty pharmacies. A pharmacist-managed HCV treatment clinic allows for addressing drug-drug interactions (DDIs), mitigation of adverse drug events, adherence education, and immunization administration, among other benefits. The aim of this research is to determine if the combination of a pharmacist-managed clinic with a specialty pharmacy provides financial and clinical benefits.

Methods: This concurrent analysis includes all patients referred to the pharmacist managed clinic from December 1, 2018 thru February 28, 2019 who were 18 years of age or older and had at least one visit to the HCV clinic by the end of the referral period. Patients referred to the HCV clinic are seen for an initial visit and one follow up visit four weeks after initiating therapy. The initial visit consists of identifying DDIs, medication and adherence education, initiation of prior authorization process, ordering of any necessary laboratory tests. Also at this visit, it is determined the best pharmacy to fill the medication for the patient based on their preference and insurance coverage. Four-week follow up visits are used to assess any new drug interactions or adverse drug effects, reinforce adherence, and evaluate effectiveness of current drug therapy as determined by HCV viral load. Patients are not currently charged for these pharmacist visits. The primary outcome is the number of pharmacist and technician full time equivalents (FTEs) that may be supported by this program. Secondary outcomes include

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undetectable viral load at four weeks, DDIs identified, turnaround time for patients receiving medications, and the percentage of fills able to be dispensed internally.

Results: For the primary outcome, yearly financial projections based on current referral rate indicate that the pharmacist-managed HCV clinic will generate enough revenue to support two pharmacists and five pharmacy technicians if 20 new patients are seen each month. These projections were based on the capture rate in this analysis, which determined that 64% of the new HCV prescriptions sent (n=50) were filled internally at the St. Elizabeth Specialty Pharmacy. A total of 65 referrals were received within the study period with 91% of those patients being seen for an initial visit and 75% starting direct-acting antivirals for HCV treatment. Of the patients who received four weeks of medication therapy (n=37) during the study period, 73% completed follow up laboratory tests. The rate of undetectable viral load was 81% of those for whom data was available. The other 19% of patients with follow up HCV viral load data had detectable viral loads, though all were 99%.

Conclusion: The combination of a pharmacist-managed clinic and a specialty pharmacy provides financial and clinical benefits to patients and health systems. This is an effective model for personnel resource allocation even without reimbursement for clinical pharmacy services. A limitation to this study is that facility space, utilities, and other ancillary costs were not included in the cost analysis. Additionally, the potential costs associated with drug treatment failure due to DDIs or non-adherence that may have been avoided by pharmacist interventions were not quantified in the current analysis.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 9-M

Poster Title: Implementation of a multidisciplinary chronic care management service within a patient-centered medical home

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Purpose: Chronic care management (CCM) is a non-face-to-face billable service for Medicare beneficiaries with two or more chronic conditions. The aim of CCM is to improve care coordination, encourage value-based care, and reduce overall healthcare spending. Pharmacists can play a key role in this multidisciplinary care approach and provide care for patients in the interim of their primary care provider visits. This project was designed to establish a sustainable and reproducible CCM service which could then be expanded to all 14 clinics within the healthcare organization.

Methods: Chronic care management services for qualifying Medicare beneficiaries were implemented within a patient-centered medical home beginning May 1, 2018 and data was collected through December 31, 2018. A multidisciplinary work-group was established to outline roles, responsibilities, and workflows and included ambulatory care pharmacists, the clinic supervisor, physicians, nurses, information technology, and finance. Patients qualified to receive telephonic pharmacy services if they met one or more of the following criteria: prescribed ten or more chronic medications, uncontrolled diabetes with a hemoglobin A1C greater than 9 percent, uncontrolled hypertension with blood pressure greater than 140/90 mmHg, uncontrolled hyperlipidemia with a low-density lipoprotein greater than 100 mg/dL, prescribed one or more high-risk medications defined as an anticoagulant, opioid, insulin, or sulfonylurea. Pharmacists and their extenders performed comprehensive medication reviews, managed chronic disease states within the scope of the collaborative practice agreement, and

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updated patient care plans for chronic diseases. Any medication related problems identified were recorded within the electronic medical record using a tool previously built that allows for reporting. At the end of each calendar month, the cumulative time spent on CCM services by all team members was billed incident-to the primary care provider.

Results: Between May 1, 2018 and December 31, 2018, 52 patients were enrolled in the CCM service of which 47 qualified for and received pharmacy services. A total of 208 CCM current procedural terminology (CPT) codes were billed and 97 percent successfully obtained reimbursement for a total of 9,000 dollars in revenue. There were 19 complex CCM services billed for and pharmacy services were involved in all complex billing.

Conclusion: A clinic-wide multidisciplinary CCM service was successfully implemented in a primary care clinic setting and provided interim care for patients via telephone encounters. Pharmacists provided the majority of patient care minutes along with higher reimbursement opportunities related to their ability of contributing to complex billing. This clinical service pilot achieved its goal of creating a sustainable and reproducible CCM service as it will be continued in the pilot clinic and the workflow utilized to implement this service into other clinics within the healthcare organization.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 10-M

Poster Title: Impact of comprehensive medication management (CMM) on transitions of care following hospitalization

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Purpose: Development of transitions of care programs to reduce hospital readmissions and improve patient outcomes is a focus of health systems. The Hospital Readmission Reduction Program (HRRP) reduces payments for all Medicare patients to hospitals that have above-average 30-day readmission rates for certain disease states. In 2017, 29 percent of hospital systems will be penalized with a monetary impact expected to total 528 million dollars. The purpose of this quality improvement project was to determine if a telephonic Comprehensive Medication Management (CMM) visit following hospital discharge would reduce 30-day readmission rates within an integrated healthcare system.

Methods: This study was conducted at three separate primary care clinics within an integrated healthcare system. Each clinic had an ambulatory care pharmacist or ambulatory care pharmacy resident and had developed a transition of care workflow with the primary care providers and care management team at that clinic. The study population included patients 18 years of age or older who had a primary care provider at the selected clinics and were identified as high risk for readmission. High risk was defined as (1) three or more emergency department visits in the last six months or (2) three or more hospital admissions in the last 12 months. Patients were identified using an online dashboard that provided real-time hospital admission and emergency department (ED) visit data. Following identification, the pharmacist would call each patient within 48 hours of discharge to conduct a transition of care comprehensive medication review. Pharmacist interventions were documented using a standardized tracking

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form. The primary outcome was a readmission within 30 days of hospital discharge. Readmission was defined as an emergency department visit or inpatient admission. Secondary outcomes included determining the number and category of medication therapy problems encountered following a hospitalization and assessing the financial impact of delivering CMM during transitions of care. The outcomes of the project were assessed using a retrospective analysis following implementation of the transitions of care workflow.

Results: Thirty-five patients across three clinics were identified for the intervention cohort and 195 patients were matched for the comparator cohort. There were no significant differences between cohorts for baseline characteristics. For the intervention cohort, there were 71 medication therapy problems identified at discharge with an average of 2.03 medication therapy problems per patient. There were 52 medication therapy problems related to indication and effectiveness, 8 related to safety, and 11 related to adherence. There were five readmissions in the intervention cohort with a readmission rate of 14.3 percent and 71 readmissions in the comparator cohort with a readmission rate of 36.4 percent. The difference in readmission rates was found to be statistically significant, P value equals 0.009. Of those readmitted in the intervention cohort, three were emergency department visits and two were inpatient admissions. The estimated cost for an emergency department visit was 299 dollars and for an inpatient admission was 4,448 dollars. Based on these estimates, the cost savings for preventing 30 readmissions in the intervention cohort would be 58,753 dollars.

Conclusion: A pharmacist-led CMM visit during transitions of care resulted in a significantly reduced readmission rate when compared to a matched cohort. This reduction in readmissions translated into significant cost savings with a favorable return on investment for pharmacist time.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 11-M

Poster Title: Implementation of a pharmacy-driven transitions of care service after discharge from a rural community hospital

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Purpose: The first aim of this study was to retrospectively evaluate inpatient transition of care (TOC) interventions and medication data to identify potential for continued patient education and optimization of medication therapy after hospital discharge. The second aim of this project was to provide comprehensive patient education, evaluate pharmacist interventions, and assess patient satisfaction after implementation of a new pharmacy-led service. This service offered one-on-one appointments with a pharmacist to provide medication education and therapy recommendations to their primary care provider (PCP) after hospital discharge from a rural community hospital.

Methods: Transitions of care pharmacists currently provide a pre-discharge medication review service for patients discharging from the hospital during normal weekday hours. This review includes patient education, medication counseling, disease-state pharmacotherapy review, and medication reconciliation. Interventions documented by TOC pharmacists from October 2016 until October 2017 were evaluated to determine the potential impact on a post-discharge pharmacy appointment prior to patients' PCP follow-up appointment. Transitions of care pharmacist interventions evaluated included: coordination of care, medication dosing, therapy optimization, intended therapy missing, insurance/payment assistance, and missing home medications added. Interventions made that had potential to cause harm were also evaluated. Patients discharged during evening/weekends did not have access to the TOC pharmacist

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service, which identified a patient population gap and opportunity for improved patient care with a post-discharge pharmacist appointment. High-risk patients discharged from the hospital were offered the opportunity for a pharmacist-led appointment on the same day as their follow-up PCP appointment. This appointment aimed to ensure appropriate medication management, provide education, and aid in the achievement of patient and disease-state specific healthcare goals. Pharmacist interventions and patient satisfaction were evaluated to determine the impact of a post-discharge pharmacist appointment.

Results: In the first aim, pharmacists made over 2300 interventions (1.7 interventions/patient) relating to improper medication management. There were a total of 118 days without a TOC pharmacist. By extrapolating the data from days with TOC interventions to days without TOC interventions, it was predicted that approximately 348 interventions with potential to cause harm were missed during this period. Of the TOC interventions, coordination of care interventions had the most numerous interventions, less that could potentially cause harm (n=26/456, 5.7%). Optimization interventions had the highest amount of interventions with the potential to cause harm (n=145/349, 41.3%), and missing intended therapy interventions had the highest proportion of interventions with percentage to cause harm (n=59/119, 49.6%). The second aim included 26 patients, with 16 patients (62%) accepting the clinical pharmacist appointment. The average age was 68.5 years of age, average LACE+ score was 65.3, and these patients were prescribed an average of 2.7 new medications upon hospital discharge. An average of 2.5 medication recommendations and an average of 2.2 Class D or higher drug-drug interactions per patient were identified. Overall provider acceptance rate of pharmacist recommendations was 87%. Overall, patient satisfaction as reported via survey was high.

Conclusion: Outpatient pharmacy-led transitions of care appointments provide clinically significant interventions and high satisfaction for patients recently discharged from a rural community hospital.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 12-M

Poster Title: Determining the number of pharmacy-physician collaborative encounters to positively impact patients with diabetes in a rural clinic setting

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Purpose: Integration of pharmacist focused diabetes management in rural practice areas has been shown in the literature to overcome barriers of low health literacy and primary care provider shortages. However, despite these available resources, not all patients take advantage. Monitoring patient adherence to follow-up appointments is another step to encourage patients to self-manage their medical condition through disease understanding and medication adherence. In an effort to address quality management of diabetes care in a rural clinic, all patients seen collaboratively with pharmacist and physician provider were tracked for adherence to appointments and evaluated for impact on hemoglobin A1c.

Methods: A retrospective chart review was conducted at a single rural clinic site evaluating collaborative pharmacy-provider diabetes care encounters occurring over the last calendar year. Inclusion criteria was limited to active patients in a rural clinic site with at least one collaborative encounter focusing on diabetes management. Patients were excluded if repeat hemoglobin A1c following initial collaborative appointment had not been collected or patients did not attend their collaborative appointment. Data collected reflected information over the last calendar year. Information gathered included demographics, time between appointments, initial and subsequent hemoglobin A1c, and number of collaborative appointments focused on diabetes care. Data was analyzed with descriptive statistics.

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Results: One hundred thirty-eight unique patients with diabetes were identified who had at least one collaborative appointment in the calendar study period. Twenty-five were excluded due to repeat hemoglobin A1c not being resulted, three others were excluded due to miscoding for appointment type, and one additional patient was deceased and information was not collected. A total of one hundred and nine unique patients were included in the analysis. The average age was 66 years and 51 percent of patients were male. Seventy percent of patients were found to have a decrease in hemoglobin A1c of 2.08 with standard deviation of 1.4. Thirty percent of the patients had an increase in hemoglobin A1c of 1.39 with standard deviation of 1.84. For those with a decrease, there was an average of 3.32 collaborative encounters per year. Patients with an increase in hemoglobin A1c averaged 2.66 diabetes collaborative encounters. Total change in hemoglobin A1c for population was a decrease of 1.06 and standard deviation of 2.33 with 3.25 collaborative encounters.

Conclusion: This study suggests that exposing patients with diabetes to a pharmacist care team collaborating with physician providers has an overall reduction in A1c levels with approximately 3 to 4 encounters per year. A total of seventy percent of the study population found a reduction in their A1c with the integration of a pharmacist team in their diabetic care. The success of the collaborative appointment with average of 3 to 4 appoints per year, could be considered for the care approach to other chronic disease conditions where pharmacist can have a positive impact on clinical outcomes.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 13-M

Poster Title: Project PACT-stroke: pharmacists act on care transitions in stroke

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Purpose: Stroke is the fifth leading cause of death in the United States and is more disabling than it is fatal. The risk of recurrent stroke is 8-10% during the 7 days and one in four strokes each year is preventable. Studies show that urgent assessment and treatment of such patients can reduce hospital bed-days, acute costs, and 6-month disability. At our institution, patients discharged from the hospital following a stroke are scheduled with the outpatient neurology clinic at three months post-stroke. However, it is unclear if these patients would benefit from earlier, more urgent follow up.

Methods: At our institution, an initiative was implemented to have the pharmacist provide more timely post-stroke care at both 48-72 hr and 30 days following hospital discharge. The objective of this study is to evaluate this newly implemented service and determine whether more urgent follow-up by the pharmacist leads to improved outcomes in patients when compared to the current 90-day standard at our institution. This study will utilize a retrospective report of patients that are post-stroke who were seen by the outpatient neurology clinic three months later. This population will serve as the historical cohort (i.e., did not receive the 48-72 hr and 30-day post-stroke pharmacist follow-up). To evaluate the impact of the newly implemented service, another retrospective report will be run to identify patients who experienced a recent stroke (within previous 48-72 hours). These patients will receive a 48-72 hour and a 30-day follow-up phone call from the pharmacist and data will be collected and compared to our current 90-day standard of care. Examples of data collected will include

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patient demographics, readmission rates, and drug-related problems such as medication access issues, adherence barriers, drug-drug interactions, and side effects. Any identified drug-related problems will be relayed to the outpatient neurology providers.

Results: A total of 317 charts were reviewed (including historical cohort and PACT-Stroke group). Of those, 67 patients met inclusion criteria - 40 patients in the historical cohort and 27 patients in the PACT-Stroke group. Patient demographics did not differ much between groups, although baseline blood pressure and LDL was higher in the PACT-Stroke group when compared to the historical cohort. For the primary objective, the historical cohort group had a hospital readmission rate of 8%, while the PACT-Stroke group had a readmission rate of only 4%. Not all patients have had their 90 day visits for the PACT-Stroke group have not yet been completed and the results of this secondary objective will be submitted to the ASHP Foundation as part of the requirements of the grant received for the project. Lastly, 35 drug-related problems were identified at 48-72 hours post-stroke by the pharmacist in the PACT-Stroke group, which reduced to 12 drug-related problems at the 30-day follow up phone call from the pharmacist. The number of drug-related problems will also be collected at the 90-day visit for all patients with the assumption these will continue to decline with pharmacist intervention.

Conclusion: The standard of care for post-stroke follow up has been 90 days for many institutions, including our own. However, more timely follow up by the pharmacist (at 48-72 hours and again at 30 days) lead to decreased hospital readmissions at 30 days. Additionally, drug-related problems identified by the pharmacist at the first follow up call (48-72 hours) were addressed and the number of drug-related problems more than cut in half by the 30-day follow up call by the pharmacist. This pharmacist impact is expected to be sustained by the 90 day follow up visit with neurology.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 14-M

Poster Title: Physician-pharmacist co-visits in the patient-centered medical home: evaluation of impact among patients with type 2 diabetes

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Purpose: The patient-centered medical home (PCMH) healthcare delivery model represents a promising way to improve primary care organization and delivery. It emphasizes five functions and attributes: comprehensive care, patient-centeredness, coordinated care, accessible services, and quality and safety. Physician-pharmacist co-visits may enhance comprehensive medication therapy management within the PCMH model, but evidence supporting this co-visit strategy is limited. The purpose of this pilot study was to evaluate the clinical impact of physician-pharmacist co-visits in patients with type 2 diabetes (T2D).

Methods: This was a prospective study conducted at a primary care clinic in Southern Maine with one full-time embedded clinical pharmacist. Physicians identified patients eligible for co-visits during routine physicals or follow-ups. The 60-minute co-visit for diabetes management consisted of 40 minutes with the pharmacist and 20 minutes with the physician. Patients were included in the study if they were 18 years of age or older, had T2D, and attended a co-visit from May 24, 2018 through November 20, 2018. Patients were excluded if they were previously seen by the pharmacist for diabetes management independently or did not have a hemoglobin A1c (A1c) before and after the co-visit. The primary outcome was the median change in A1c. Secondary outcomes were adherence to a few specific American Diabetes Association (ADA) guideline recommendations including laboratory monitoring (A1c, urine microalbumin, and fasting lipid panel), immunization administration (hepatitis B vaccine and pneumococcal polysaccharide vaccine 23 [PPSV23]), and use of cardiovascular risk reduction medications

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(HMG-CoA reductase inhibitor [statin], angiotensin-converting enzyme inhibitor [ACE-I], angiotensin receptor blocker [ARB], and aspirin). The number of physician and pharmacist encounters were also noted. Continuous variables are reported as median (interquartile range) whereas categorical and binary variables are reported as frequency (percent). Change in median A1c before and after the co-visit was assessed using the paired samples Wilcoxon test and a $p < 0.05$ was considered statistically significant.

Results: Fifteen patients were seen during the six-month pilot study and eleven were included in the final data analysis. Three patients were excluded due to being independently seen by the pharmacist for diabetes management and one patient did not have a pre-and-post co-visit A1c. Baseline characteristics included a median age of 53 (48.5-56) years, 55 percent were female, and 82 percent were Caucasian. The median A1c before the co-visit was 8.3 percent (7.8-10.3) and seven patients (64 percent) had an A1c of greater than or equal to 8 percent. A1c decreased by 1.5 percent (2.25 decrease to 0.15 increase) in all patients ($p=0.1$) and 1.6 percent (3.25 decrease to 1.5 decrease) in patients with an A1c greater than or equal to 8 percent before the co-visit ($p=0.02$). The pharmacist recommended hepatitis B vaccine and PPSV23 administration in 75 percent and 100 percent of eligible patients, respectively. Two patients (25 percent) did not receive hepatitis B vaccination due to time constraints of the visit. The pharmacist recommended laboratory monitoring and use of cardiovascular risk reduction medications for 100 percent of eligible patients per the ADA guidelines. At the end of the pilot study, there were nineteen physician and twenty-nine pharmacist visits.

Conclusion: Physician-pharmacist co-visits are associated with A1c reduction in patients with a pre-co-visit A1c greater than or equal to 8 percent. Co-visits are beneficial for patients whose A1c is less than 8 percent but this finding was not statistically significant. Further, co-visits ensured adherence to ADA guideline recommendations. Future studies with larger sample sizes and additional study locations are needed to confirm these findings. This study establishes pharmacists as a valuable member of the care team in the primary care setting, who can increase access to care and improve glycemic outcomes in patients with T2D as part of the PCMH.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 15-M

Poster Title: Retrospective evaluation of evidence-based major depressive disorder management in a primary care setting

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Purpose: Major depressive disorder affects an estimated 16.2 million adults in the United States. Access to mental health providers has become challenging. Primary care providers often manage this gap in care due to their accessibility and capability to foster long-term relationships. Patients with moderate to severe depression (PHQ9 greater than or equal to 10) may be indicated to receive pharmacotherapy alone or combination therapy. The purpose of this study is to evaluate the management of newly diagnosed depression in the primary care setting to determine if possible means of improvement are warranted to standardize and guide assessment, management, and follow up.

Methods: A retrospective chart review was conducted from January 2016 to December 2017 for patients at all Coastal Medical adult and family medicine practices. Patients included in the study were at least 18 years old and had a new diagnosis of major depressive disorder. Patients were excluded if they did not have an initial PHQ9 score, diagnosis of depression prior to establishing care within Coastal, or had their depression managed by a behavioral health specialist. Baseline characteristics, initial PHQ9 scores, and all subsequent PHQ9 scores within the 11-13-month time frame were collected by chart reviewing the electronic medical record (EMR). The adequacy of major depressive disorder management was determined by reviewing the patients with an initial PHQ9 score of greater than or equal to 10 and measuring the percentage of patients who reached remission (PHQ less than 5) or response (defined as a 50 percent or greater reduction in symptoms as measured by the PHQ9). The initial treatment choice and if any changes were made, whether increase in dose, switch to another medication

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class, or augmentation in therapy were reviewed. Referrals to psychiatry and/or counseling were also reviewed.

Results: Of the 143 patients with a new diagnosis of major depressive disorder, 53 (37 percent) had a baseline PHQ9 greater than or equal to 10, and 90 (63 percent) had a PHQ9 less than 10. In those with moderate to severe depression (PHQ9 greater than or equal to 10), 21 (40 percent) were initiated on a medication and 21 (40 percent) agreed to referral to behavioral health. Of the 12 patients with moderately severe to severe depression (PHQ9 greater than 15) who are indicated for pharmacological therapy, only 4 (33 percent) agreed to initiate a medication. Of the patients with a PHQ9 greater than or equal to 10, 39 patients (74 percent) reached the primary outcome of remission and/or response. Fourteen patients (26 percent) did not reach remission and/or response. Of the 14 patients that did not reach the primary outcome, 6 (43 percent) were initiated on a medication. Upon follow up after at least 6 months from the baseline PHQ9 screening, the following occurred: no changes occurred in 5 patients; 2 patients had self-discontinued their medication; 2 initiated therapy; 2 agreed to a referral to behavioral health; 1 switched agents; and it is unknown what occurred with 2 patients.

Conclusion: Primary care providers at Coastal Medical are appropriately managing depression to assist patients in reaching remission or response based on PHQ9 scores. However, the improvements in depression seem to occur regardless of the use of antidepressants and/or referral to behavioral health. Further studies are needed to determine why patients did not initiate therapy or utilize behavioral health services despite a positive PHQ9. A depression treatment pathway will be created to support primary care providers in their efforts to identify, assess, and manage adult patients with depression.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 16-M

Poster Title: Pharmacists targeting social determinants of health in patients with diabetes in a safety net hospital

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Purpose: The prevalence of diabetes has continued to rise in the United States. In 2015, approximately 9.4% of the US population had diagnosed diabetes. Though improved control may result from medication therapy optimization, sustained improvements may be impeded by social determinants of health. The American Diabetes Association guidelines highlight that social situations should guide treatment decisions. 57% of our patient population at Boston Medical Center is underserved, making it vital to assess these social needs to improve care. The primary study aim was to improve patient reported food and medication access by 10% each at 4 months.

Methods: A retrospective review of a quality improvement pilot was conducted in patients with diabetes who saw a clinical pharmacist in the Family Medicine Clinic at Boston Medical Center. The pilot program began on November 5, 2018 and all patients will receive the intervention. Data was only collected on patients seen between November 5 and November 30, 2018 to allow for follow-up data to be collected. Data on patient's first follow-up visit was collected on March 5, 2019, with a follow-up analysis planned on May 5, 2019. Patients were excluded if they did not have Type 2 Diabetes, were less than 18 years old or had no follow-up visit with the clinical pharmacist after their initial visit. Data was collected on patient demographics (age, sex, and race), A1C, healthcare utilization, new versus established referral to pharmacist, and food and medication access needs. Data was analyzed using descriptive statistics.

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Results: Overall, 55 patients were included for analysis. The average patient's age was 59.7 years, 38.2% of patients were male and 61.8% were female. The majority of patients (67.3%) were African American, 5.5% were Caucasian and 3.6% were Asian (23.6% declined/not available). 92.7% of patients had established pharmacist referrals and 7.3% had new referrals. At baseline 83.6% of patients denied having medication access needs (9 patients reported need) and 50.9% of patients denied having food access needs (27 patients reported need). At follow-up, 83.6% of patients denied having medication access needs (no change from baseline) and 72.7% of patients denied having food access needs (21.8% improvement). Of the 9 patients who reported medication access needs at follow-up, 5 patients had new access needs and 4 had maintained their access needs. Of the 15 patients who reported food access needs at follow-up, 1 patient had new access needs and 14 had maintained their access needs. Average A1C increased by 0.2%, from 9.0% to 9.2%. Emergency room utilization average was 0.49 visits per person at baseline and 0.45 visits per person at follow-up. Inpatient visits average was 0.09 visits per person at baseline and 0.07 visits per person at follow-up.

Conclusion: The primary aim to improve patient reported food and medication access by 10% each at 4 months was achieved only for food access. Medication access did not improve over time, likely due to insurance changes (copays, deductibles) after the new year. Limitations of the study were the loss of patients to follow-up, short study duration, loss of patient navigators in clinic, and lower than anticipated medication access needs at baseline. Another follow-up will be conducted in May, 2019 to determine outcomes on A1C, healthcare utilization and access needs when pharmacists continually assess social determinants of health at every visit.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 17-M

Poster Title: Community health workers' and pharmacists' perceptions and experiences of an academic-community partnership providing telephonic medication therapy management services: a focus group study

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Purpose: The literature is limited concerning the collaboration between community health workers (CHWs') and pharmacists in the delivery of medication therapy management (MTM) services. The Rural Arizona MTM (RAzMTM) program involved an academic medication management call center-community pharmacy partnership to provide telephonic MTM services to underserved, rural residents. This study sought to identify CHWs' and call center health professionals' (pharmacist, nurse, pharmacy intern) knowledge, attitudes, and barriers towards MTM collaborative practices between healthcare professionals. This information could help address a practice gap while improving MTM collaborative practice approaches.

Methods: A descriptive, qualitative study, using semi-structured focus groups, was conducted with CHWs and call center health professionals who participated in the RAzMTM program. Participants consented to participate prior to the focus groups. All materials were designed specifically for this project, including a focus group guide with open-ended questions, prompts, and probes to obtain individual and collective views of the health professionals engaged in MTM collaborative practice. Participants also received and completed a short demographic questionnaire. Three facilitators were present at each focus group; one facilitator guided the discussion while the others took notes. Focus groups were audio recorded to verify all

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responses. Auto recordings were transcribed verbatim with omission of participant identifiers, using an online transcription service. Two independent reviewers conducted thematic analysis of the transcripts, with discrepancies resolved by a third reviewer. This project was approved by the University of Arizona Institutional Review Board.

Results: Overall, participants (N=9) were mostly female (89 percent), college graduates and/or post-graduate/professional degree (78 percent) and described their ethnicity as Hispanic or Latino (89 percent); there was some demographic variation between groups. One focus group included two CHWs and one quality assurance compliance manager; the second focus group included two pharmacists, three pharmacy interns, and one nurse. Five themes were identified: 1) roles and responsibilities of the RAZMTM participants, 2) benefits of the unique RAZMTM program, 3) RAZMTM participants' interprofessional experience, 4) professional growth for RAZMTM participants, 5) opportunities for improvement for the future. The participants' perception of the RAZMTM program was consistent. The responsibilities among the participants included: identification of patients, scheduling/coordinating appointment and providing telephonic MTM services. The participants felt the RAZMTM program was valuable and they had acquired knowledge during the program. The CHWs' and health professionals' experience was positive; they recognized the benefit of each other's involvement in the program and learned how they can work together to improve patient care. Participants also revealed the program assisted their professional development, by working in a unique interprofessional environment. Future recommended program improvements included improving ease of scheduling. (e.g. extend pharmacist availability to provide MTM services).

Conclusion: These results suggest that a telephonic MTM service utilizing an interprofessional partnership with CHWs and healthcare professionals was positively perceived by participants in improving patient care. Furthermore, these results provide perceptions of interprofessional partnerships and support the need to develop additional interprofessional telephonic services in rural and underserved areas.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 18-M

Poster Title: Defining outcomes for evaluation of ambulatory clinical pharmacy services at a large academic health system

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Purpose: Pharmacists are highly trained medication experts who positively influence patient care in the ambulatory setting. Ambulatory care pharmacists have demonstrated enhanced quality of care for patients by improving safety, effectiveness, patient-centeredness, and timeliness. Pharmacists in Connecticut use collaborative drug therapy management (CDTM) to initiate, modify, or discontinue therapy for chronic conditions including diabetes, hypertension, hyperlipidemia, chronic lung diseases, and nicotine cessation. In order to measure these outcomes, documentation within the electronic medical record must be optimized. It is essential to identify meaningful and measurable outcomes to assess impact and justify expansion of ambulatory clinical pharmacy services within our health system.

Methods: A literature review was conducted for published data on outcomes assessment for pharmacists in the ambulatory setting, yet there is no current consensus or benchmark. Given the lack of a national standard, national organization and healthcare payer metrics were used to compile outcomes. These metrics were then reviewed for relevance to ambulatory pharmacy practice and included if they aligned with current practice. Outcome measures were identified on the premise that they must be meaningful, feasible, and actionable. Health system leadership was engaged to ensure proposed outcomes aligned with overall goals for the health system. Additionally, outcomes identified were aligned with both fee for service and value-based reimbursement models given different clinic reimbursement structures and in anticipation of the changing reimbursement landscape. A comprehensive evaluation of

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pharmacist services was conducted at both hospital based and accountable care organization (ACO) clinics within the institution. This review identified current disease states managed, interventions, and documentation practices at pharmacist clinics to align with identified outcomes. Identified outcomes were then assessed for the capability to extract the data from the medical record. Aligning outcomes with nationally published metrics and those important to healthcare payers is critical to demonstrate the impact of pharmacy services on overall patient care. This can ultimately lead to changes in reimbursement for pharmacy services and ultimately justification for pharmacist services.

Results: The outcomes identified for ambulatory services within our health system were compiled and reviewed to align with current recommendations from national organizations including the National Committee for Quality Assurance (NCQA) through creation of Healthcare Effectiveness Data and Information Set (HEDIS) measures and Centers for Medicare and Medicaid Services (CMS) Five-Star Quality Rating System. Outcomes included metrics important to both fee for service as well as value-based reimbursement. It was determined that there is a need to monitor clinical endpoints based on the disease states pharmacists manage to demonstrate their effect on care. Clinical endpoints were stratified by disease states managed by pharmacists under the CDTM. Additionally, there is a role to report interventions that can result in a reduction in total cost of care through reductions in emergency department visits and hospital admissions for patients engaged with a pharmacist. Pharmacists can contribute to patient care through identification of medication discrepancies on medication reconciliation, adverse drug event avoidance and adherence. There is a need to ensure these interventions are documented in a means that can be reported. Thus, optimization of pharmacist documentation of these interventions was implemented in addition to a clinical monitoring dashboard to report clinical outcomes.

Conclusion: Identification and measurement of meaningful outcomes is essential to evaluate the impact of ambulatory clinical pharmacy services. Outcomes must be continuously reassessed to ensure alignment with standards set by national quality organizations and payers. Outcomes must be relevant to a fee for service and value-based reimbursement model to demonstrate meaning in the ever changing billing landscape. Positive clinical outcomes can potentially be used to negotiate commercial and state Medicaid payer contracts prior to the realization of provider status at a federal level. Effective and timely outcome reporting will contribute to expansion of ambulatory clinical pharmacy services.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 19-M

Poster Title: Impact of pharmacist driven comprehensive medication management in primary care physicians' offices at an accountable care organization on value based performance measures

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Purpose: Payment models continue to shift from fee for service models to value based performance (VBP) models. Clinical pharmacists are specially trained to provide comprehensive medication management (CMM) and create an individualized care plan that can improve medication adherence, patient satisfaction, along with other clinical outcomes. The purpose of this study was to determine if pharmacist delivered CMM in a primary care office network would improve performance on VBP measures. This network comprises of 30 primary care offices and participates in an accountable care organization. Beginning in August 2018, ambulatory pharmacy services were implemented in four of those primary care offices.

Methods: The institutional review board approved this open label, controlled group study. CMM was performed by an ambulatory pharmacist based on recommendations from the Joint Commission of Pharmacy Practitioners (JCPP) and The American College of Clinical Pharmacy (ACCP) in patients meeting one or more of the following criteria: taking 12 or more medications, 2 or more admissions within last 12 months, uncontrolled diabetes mellitus, heart failure (HF), chronic obstructive pulmonary disorder (COPD), acute myocardial infarction (AMI) (Hgb A1c 8 percent or higher, admission for HF within 12 months, COPD exacerbation within 12 months, AMI admission within last 12 months), or identified by provider as in need of CMM services. Matched control patients were identified. Pharmacists met with patients in the office or spoke with them via telephone. Patient satisfaction surveys were given to the patient to

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complete at their visit or mailed to them within 1 month of CMM. A provider satisfaction survey was sent to prescribers. Primary outcomes included number of patients with controlled hypertension, controlled diabetes and appropriate statin intensity, number of emergency department (ED) visits, and number of all cause hospital admissions at 3, plus or minus, 1 months. Secondary objectives included change in Hgb A1c and LDL 3, plus or minus, 1 months after CMM, patient satisfaction, provider satisfaction, and percentage of pharmacist recommendations accepted by the prescriber.

Results: 106 patients received CMM services and were matched with 106 control patients. Demographics were matched between groups except for ED visits being higher in those receiving CMM services (0.42 vs 0.11, $p=0.0065$). There was a significantly higher number of patients with controlled hypertension who received CMM services compared to controls (89 vs 68 percent, $p<0.0001$). There was not a significant difference between groups in controlled diabetes mellitus (75 vs 88 percent, $p=0.106$), appropriate intensity statin (57 vs 51 percent, $p=0.442$), number of ED visits (0.509 vs 0.381, $p=0.5772$), or all cause admission (0.283 vs 0.467, $p=0.0914$). Although not statistically significant, there was a greater decrease in Hgb A1c in patients who received CMM services (-0.5 vs -0.15 percent, $p=0.1072$). Change in LDL was minimal, and no difference was seen between groups (-1.67 mg/dL vs -2.36 mg/dL, $p=0.9082$). Of 609 recommendations, 227 (37 percent) were accepted by prescribers. 47 (44 percent) patient satisfaction surveys were returned and 96 percent of patients agreed they would recommend the clinical pharmacist to a family member or friend. 14 of the 30 prescribers (47 percent) completed the survey. Of those, 93 percent agreed patients benefit from seeing the pharmacist.

Conclusion: Pharmacist performed CMM resulted in improvement in some, but not all, VBP measures. There was a significant increase in number of patients with controlled hypertension in those who received CMM service. Both providers and patients were satisfied with ambulatory pharmacists' CMM services. In both groups, there was a low percentage of patients receiving appropriate intensity statin.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 20-M

Poster Title: Six-year analysis of statin utilization rates in a primary care clinic before and after the 2013 ACC/AHA cholesterol guidelines

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Purpose: The benefits of statin therapy in reducing cardiovascular disease have been demonstrated in both primary and secondary prevention studies. The 2013 American College of Cardiology/American Heart Association (ACC/AHA) cholesterol guideline identifies four high risk populations for statin therapy including patients with previous atherosclerotic cardiovascular disease (ASCVD) history, low density lipoprotein (LDL) greater than or equal to 190mg/dl, previous history of diabetes and a calculated ten-year risk greater than or equal to 7.5 percent. It was projected that applying the guidelines to large, sample cohorts will result in a 12-16 percent increase in statin prescribing.

Methods: This was a retrospective observational study using electronic medical records to search and identify patients eligible for statin therapy. The study period was from November 1, 2010 through October 31st, 2016 with the release of the guidelines in 2013 representing the midpoint thus creating two groups of patients – pre and post ACC/AHA guideline revision. Three-month time intervals were used to create a cross-sectional time-series study design to evaluate changes in statin utilization rates over the six-year period. Statin utilization rates were calculated by dividing the number of patients with an active statin medication on their medication profile with the number of eligible patients. Patients were included if they visited a provider with records of cholesterol testing, blood pressure measurement, and demographic data including gender, race, and smoking status. Ten-year ASCVD risk scores were calculated using the pooled cohort equation. Chronic diseases or conditions were identified by diagnostic codes. Any patient with documented statin allergy, elevated liver function enzymes greater

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than or equal to 3 times upper limit of normal, or pregnant were excluded from analysis. For parametric data, Student's t-test and 95 percent confidence intervals were used to determine whether the mean percent statin use changed following guideline revision. All analyses were performed with Statistics Analytical System (SAS 9.4, SAS inc. Cary, NC. U.S.A). The ETSU/VA Medical Campus Institutional Review Board approved the study.

Results: Over the six-year period, statin eligible patients with a previous history of ASCVD, LDL greater than or equal to 190mg/dl, previous history of diabetes or ten-year risk greater than or equal to 7.5 percent completed 54392, 3552, 55395 and 75018 office visits, respectively. The percent of patients receiving statins pre and post guideline revision were 79.8 percent versus 77.6 percent (95 percent CI 1.3 – 3.0, p less than 0.0001), 56.9 percent versus 52.8 percent (95 percent CI 0.7 – 7.4, p equals 0.02), 66.1 percent versus 66.0 percent (95 percent CI -0.8 – 0.9, p equals 0.89), and 46.4 percent versus 43.1 percent (95 percent CI 1.9 – 4.7, p equals 0.0002) for patients with a previous history of ASCVD, LDL greater than or equal to 190mg/dl, previous history of diabetes or ten-year risk greater than or equal to 7.5 percent, respectively.

Conclusion: Statin utilization rates decreased in three out of the four high-risk populations in this primary care clinic over a six-year period. However, the utilization of statins in patients with diabetes remained stable. These results are contrary to the predicted increase in statin prescribing patterns following guideline revision. The clinical significance of the decline in statin prescribing is worth noting. Interventions involving clinical pharmacists aimed to improve evidence-based statin utilization have been implemented.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 21-M

Poster Title: Utilizing the pharmacy team to improve HEDIS measures by increasing statin prescribing in primary care patients with type 2 diabetes

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Purpose: The VA San Diego has been underperforming in the Healthcare Effectiveness Data and Information Set (HEDIS) measures for statin use in patients with diabetes. In August 2018, the pharmacy team identified diabetes patients who were eligible for statins by utilizing the electronic quality measure (eQM) provider dashboard as part of the population health workflow to improve the hospital's measures. From November 2018 - February 2019, patients were contacted through various methods (letter, secure message, phone call) to initiate a statin. The objective of this project is to determine the impact of pharmacists' interventions on statin prescribing in patients with diabetes.

Methods: In this single-center, IRB-exempt, retrospective, pre-post study, adults aged 40-75 years who were enrolled in the primary care clinics at the VA San Diego with a diagnosis of type 2 diabetes, but without an active statin prescription or with an expired statin prescription, were included in this study. Vulnerable populations, those with contraindication to statins, those with at least 1 adverse drug reaction to statins, or those who have not seen their primary care provider in over 1 year were excluded. The primary outcome is the percent increase in the number of eligible diabetic patients prescribed a statin (from those who were not previously on statin therapy), while the secondary outcomes include changes or improvement in the "Statin therapy for patients with diabetes" HEDIS measure and treatment engagement after mailed outreach, secure messaging, and phone calls (defined as the number of patients who initiated a statin after each method of contact). The sample size estimated to achieve 80% power was approximately 2000 patients based on an effect size of 10%. P-values will be two-sided and

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considered statistically significant if less than 0.05, and a one sample Chi-square test was used to conduct the data analysis.

Results: 642 patients were identified from the eQM dashboard as having a diagnosis of diabetes, but not on a statin. In terms of reasons for not being on a statin, approximately 39.7% of patients had previously refused statins, and approximately 4.5% had an intolerance to statins. The rest of the patients had miscellaneous reasons, particularly no documented discussion of statin. For the primary outcome, 179 patients met the inclusion criteria for receiving the pharmacy interventions, and 47 patients (approximately 26%) were initiated on a statin. All included patients received a letter. 64 patients (35.8%) received a secure message, while 148 patients (82.7%) received a phone call. In terms of secondary outcomes, the VA San Diego's HEDIS measures improved from 65.92% to 66.02% from the 2018 Quarter 4 to 2019 Quarter 1, which was equivalent to the percentage increase in the national HEDIS performance measure. For treatment engagement, 7 patients started a statin after receiving the letter. 4 patients started a statin after receiving a secure messaging, while 36 patients started a statin after receiving a phone call.

Conclusion: The pharmacy team's interventions demonstrate a trend toward clinically significant improvement in the HEDIS measure for statin use in patients with diabetes, and it appears as though phone calls are the most effective method for engaging patients in treatment. Future studies evaluating the impact of conducting more interventions would assist in confirming the benefit of pharmacy interventions.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 22-M

Poster Title: Evaluating provider acceptance of pharmacist interventions in the discharge companion program and its impact on readmission reduction

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Purpose: The Discharge Companion Program (DCP) is a care transitions partnership between a local hospital and a medication therapy management service provider in southern Arizona. Pharmacists' roles in the DCP were to review discharge medications and conduct two follow-up telephonic consultations with patients, within the first week and three weeks post-discharge. The DCP nurses' role was to track referrals and readmissions and communicate pharmacist interventions to primary care providers (PCP) or skilled nursing facility (SNF) staff. The purpose of this study was to evaluate provider acceptance of DCP pharmacist interventions and the impact of interventions on hospital readmissions for participating patients.

Methods: The study involved a retrospective record review of all patients referred to the DCP who received an initial pharmacist consultation within the first week of discharge; the study period was between January and October 2018. Data collected included: patient demographics; discharge diagnosis and disposition; number and type of pharmacist interventions; number of co-morbidities and accepted interventions on follow-up consultation or readmission; technology used to transmit interventions; and communication modality and readmission within 30-days. Chi-square tests assessed the association between provider acceptance, communication modality and technology used. A logistic regression model was built to test for

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the association between readmission risk and other variables of interest. The a priori alpha level was set at 0.05.

Results: A total of 197 patients were referred to the DCP program and 102 individuals met the inclusion criteria. DCP pharmacists made a total of 271 interventions, of which 185 (68.7%) required provider action. The most common actionable intervention type was drug addition or discontinuation (n=74, 40%) while the most common communication modality occurred between DCP nurses and PCP offices/SNFs (n=56, 54.9%); and the telephone was the most common technology used (n=58, 56.9%). Provider acceptance rate was 30.8% (n=57) of actionable interventions. Provider acceptance was not associated with a significant reduction in 30-day readmission ($P = 0.833$) nor did it significantly differ when interventions were communicated to other pharmacists, medical assistants or to PCP office/SNF staff ($P = 0.53$). Provider acceptance was not significantly affected when communication of interventions was via telephone, fax or both ($P = 0.133$). The overall readmission rate among the study cohort was 22.5% (n=23). The only significant predictor of 30-day readmission identified in the logistic regression model was number of co-morbidities (Odds Ratio 1.28, 95% CI 1.03 – 1.58, $P = 0.024$).

Conclusion: Provider acceptance of pharmacist interventions did not differ significantly when interventions were communicated to other healthcare professionals involved in the patient's care nor by mode of communication (telephone, facsimile). Finally, provider acceptance of pharmacists' interventions did not significantly affect 30-day readmission rate. Future research warrants concentrating on the role of medication counseling in a care transitions program and its effect on 30-day readmission.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 23-M

Poster Title: Interprofessional continuing education through the Vermont Academic Detailing Program

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Purpose: Academic detailing is an educational approach with a forty-year evidence-base supporting continuing medical and interprofessional education for practicing community prescribers. Pharmacists are highly qualified to develop and deliver academic detailing services to primary care prescribers, including understanding clinical trials, placing medication recommendations in context with adherence, insurance, and evidence, and developing appropriate patient education materials. Academic detailing is particularly helpful for topics with widespread public health impact, such as addressing appropriate opioid prescribing and deprescribing.

Methods: The Vermont Academic Detailing Program, in operation since 1999, is the oldest, university-based academic detailing program in the country. The statewide program involves one-to-one or small group education, using motivational interviewing and social marketing techniques to influence prescribing behavior towards evidence-based principles. Three pharmacists and two physicians serve as academic detailers in the program. Topics cover evidence-based prescribing, medication safety issues, affordability, and non-medication treatment approaches. Academic detailing sessions occur in the primary care prescribers' clinics. Sessions are up to 1 hour, are offered to all primary care prescribers in the state, and provide continuing education credit. Evaluation includes immediate post-session surveys and an

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online survey 3 months after the session to reinforce targeted behavior changes. Topics delivered in fiscal year 2018 (FY18) included managing opioids in primary care, advanced issues related to managing opioids, including deprescribing, comparing anticoagulant choices for stroke prevention in atrial fibrillation, hyperglycemia management in type 2 diabetes, and managing fibromyalgia.

Results: In FY18, 531 individual licensed prescribers attended at least one Vermont Academic Detailing Program session. Prescribers included physicians (61%), nurse practitioners (27%), and physician assistants (12%). The post-session survey responses of the licensed prescribers strongly support academic detailing as an interprofessional continuing education strategy. Six hundred and forty-nine post-session surveys were completed by the prescribers. Some prescribers attended multiple sessions on different topics. Ninety-nine percent of prescribers (631/636) indicated a willingness to attend future sessions. Ninety-nine percent of prescribers (594/595) felt the program was free of commercial bias. Ninety-two percent of prescribers (563/611) indicated that the presentation will impact their prescribing behavior.

Conclusion: Academic detailing is an educational service that is perceived as valuable by prescribers and promotes evidence-based prescribing. As not all states have a robust academic detailing program, pharmacists may be uniquely positioned to incorporate academic detailing into their pharmacy practices.

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Submission Category: Cardiology/Anticoagulation

Poster Type: Evaluative Study

Session-Board Number: 24-M

Poster Title: Evaluation of safety of switching between oral P2Y12 inhibitors

Primary Author: Sanaa ALSulami, Brigham and women's hospital; **Email:** salsulami24@gmail.com

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Purpose: Dual antiplatelet therapy with aspirin and a P2Y12 inhibitor is recommended for patients with acute coronary syndrome and post percutaneous coronary intervention with stenting in stable coronary artery disease to help prevent further thromboembolic events. Rationale for switching patients from one agent to another is multifactorial. If not switched appropriately, this may lead to an increased risk of thromboembolic events. However, there is limited guidance on appropriate strategies for switching between different oral P2Y12 inhibitors. The aim of the present study is to evaluate the switching modalities at our institution and compare them to the recently published expert consensus recommendations.

Methods: This is a retrospective descriptive analysis of patients admitted to Brigham and Women's Hospital from January 2015 to December 2018. Patients were included if they were at least 18 years of age and had documented administration of two or more different oral P2Y12 inhibitors during the same admission. The major safety endpoint is incidence of major adverse cardiac events (MACE) (cardiovascular death, myocardial infarction, stroke, and coronary artery bypass graft (CABG)-related and non-CABG-related bleeding) at seven days or until hospital discharge. Minor endpoints include incidence of in-stent thrombosis, number of patients who received loading doses pre- and post-consensus paper publication and documented reasons for switching between oral P2Y12 inhibitors during the same time-period.

Results: A total of 276 patients were identified as meeting the inclusion criteria and 120 patients were screened for inclusion, thus far. Of these, 112 patients were included (clopidogrel

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n=33, prasugrel n=9, and ticagrelor n=70). There was no incidence of the primary safety endpoint observed in any group. However, the number of patients who received loading doses when switched between oral P2Y12 inhibitors increased from 81.4% to 85.7% after publication of the expert consensus paper. The most common reasons for switching from one agent to another were cost/insurance coverage (21%), need for triple therapy (12%), and bleeding risk (12%). The limitations of this study include; but not limited to; single-center, retrospective study, incidence of MACE was not assessed after discharge, some patients' P2Y12 inhibitors were switched after receiving loading doses only, and data collection after expert consensus paper limited to one year.

Conclusion: The results of this interim analysis thus far favor safe switching between antiplatelet agents. the remaining patients will be evaluated and screened for conclusion and this data will be reported at a later date.

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Submission Category: Cardiology/Anticoagulation

Poster Type: Case Report

Session-Board Number: 25-M

Poster Title: Comprehensive and effective management of venous thromboembolism for a new onset case with series hypercoagulable episodes

Primary Author: Huey-Ling Chang, China Medical University Hospital; **Email:** olive_chang@yahoo.com

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Purpose: This case demonstrates timely and rational medical interventions and anticoagulation therapy effectively managed a new onset venous thromboembolism (VTE) case with complicated hypercoagulable conditions post pregnancy. A 34 year-old female without profound medical history who gave birth in mid-December of 2018. She was admitted to emergency department (ED) one month later in mid-January of 2019 with complains of general discomforts at home along with acute onset generalized seizure and left side weakness upon arrival. Physical evaluations appeared normal but on site non-enhanced Computed Tomography (CT) of the brain discovered infarction in bilateral cerebellum and obstructive hydrocephalus. An emergent neurosurgical operation with suboccipital craniectomy on right vertebral and basilar arteries and external ventricular drainage was performed. Subsequently, hematological reports revealed abnormal coagulation factors with protein S 13.5%, protein C 73%, and antithrombin III 79.8%. Further hospitalization has been referred through stroke and neurosurgical intensive care unit (SNCU), neurosurgical intensive care unit (NSCU), cardiac care unit (CCU), and respiratory care center (RCC). She has been comprehensively cared with follow-up examinations to manipulate conditions involved pulmonary embolisms and infarction, May-Thurner syndrome with severe DVT on left femoral vein. Pertinent medical interventions included implementation of right programmable ventriculo-peritoneal (VP) shunt, catheter-directed thrombolysis (CDT), plain old balloon angioplasty (POBA), percutaneous mechanical thrombectomy (PMT) with EKOS, and implantation of retrievable inferior vena cava (IVC) filter. Pharmacological management in anticoagulation initially applied with intravenous heparin and followed by direct oral anticoagulants (DOAC) of edoxaban and rivaroxban. The rationale of the administration of DOAC has been concerned and assessed by current evidence-based studies.

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Methods:

Results:

Conclusion:

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Submission Category: Cardiology/Anticoagulation

Poster Type: Evaluative Study

Session-Board Number: 26-M

Poster Title: Converting from ticagrelor to clopidogrel in acute coronary syndrome

Primary Author: Catherine Kiruthi, Johns Hopkins Bayview Medical Center; **Email:** ckiruth1@jhmi.edu

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Purpose: The PLATO trial demonstrated that in patients with acute coronary syndrome (ACS), ticagrelor compared to clopidogrel significantly reduced the rate of cardiovascular death, myocardial infarction (MI) or stroke. Hence, in July 2016, ticagrelor was instituted as the first-line P2Y₁₂ inhibitor in patients presenting with ACS at an academic medical center. However, due to medication cost concerns and other reasons some patients required transition from ticagrelor to clopidogrel. Limited pharmacodynamic studies provided guidance for converting between these agents and hence, providers used alternative converting methods. A medication use evaluation was performed to assess current practices for converting between ticagrelor and clopidogrel.

Methods: A retrospective chart review was performed from August 2016 to August 2017 on adult patients admitted with an ACS (ST elevation MI, non-ST elevation MI or unstable angina) who received a P2Y₁₂ inhibitor. The primary endpoints included percentage of patients converted from ticagrelor to clopidogrel, average conversion time between ticagrelor and clopidogrel, loading dose (LD) used in patients with ACS and incidence of recurrent MI. The secondary endpoints included incidence of major bleeding 48 hours after P2Y₁₂ inhibitor initiation and reasons for converting between P2Y₁₂ inhibitors.

Results: Ticagrelor was prescribed in 225 patients with ACS. Twenty percent of these patients were converted from ticagrelor to clopidogrel and 78% of patients were converted within 12 to

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24 hours. The average conversion time was 20.5 hours. Fifty four percent of patients who were converted from ticagrelor to clopidogrel received 600 mg LD of clopidogrel. Of those patients who underwent percutaneous coronary intervention with stent placement, 64% received 600 mg LD of clopidogrel. The incidence of recurrent MI was 2.2 %. No incidences of major bleeding were reported at 48 hours after P2Y12 inhibitor initiation. The most common reasons for conversion between ticagrelor and clopidogrel was high cost and increased bleeding risk.

Conclusion: Overall, the results demonstrated that the majority of patients are appropriately converted from ticagrelor to clopidogrel based on available pharmacodynamic data. However, variations in waiting periods and conversion methods were noted and may have the potential to result in adverse outcomes. Recent data from SWAP-4 trial provides some reassurance when de-escalating from ticagrelor to clopidogrel at 12 or 24 hours. Efforts have been placed on provider education as well as on the addition of a P2Y12 inhibitor conversion guidance in the electronic medical system to assist in safer prescribing of the P2Y12 inhibitors.

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Case Report

Session-Board Number: 27-M

Poster Title: Possible testosterone induced acute pancreatitis in a transgender male

Primary Author: Aaron Burton, University of St. Joseph; **Email:** aaron.e.burton@gmail.com

Additional Author(s):

Purpose: Purpose: Drug-induced acute pancreatitis is rare but should not be overlooked in a patient who presents with acute pancreatitis. More than 100 drugs have been implicated in causing the disease: testosterone has not been previously reported with acute pancreatitis.

Methods: This poster describes the case of a 19 year old transgender male who presented with acute pancreatitis after initiation of testosterone hormone therapy. He improved dramatically after intensive care; and temporary discontinuation of Testosterone. A review of the relevant literature related to exogenous sex hormone induced acute pancreatitis is also presented.

Results: The patient recently started on testosterone hormone therapy about one month ago. Testosterone cypionate 200mg/ml intramuscular solution 0.5ml (100mg) every 14 days was prescribed by the provider. However, patient reported taking the injection weekly instead of the prescribed every other week frequency. Initial assessment of the patient included presence of chills and sweats, patient was afebrile and hemodynamically stable. Patient reported some shortness of breath as well. After review of relevant labs upon admission to the community hospital, the patient was treated as an uncomplicated pancreatitis. Immediate management included IV rehydration therapy, antiemetics, and toradol and morphine for pain control per the institutions pancreatitis treatment pathway.

Conclusions: A definitive drug-induced acute pancreatitis diagnosis is a challenging for clinicians as patients may have other risk factors for pancreatitis. Often time's drug induced pancreatitis causes are only considered in the case of idiopathic causes. In addition adverse effects associated with gender transition therapy may be under reported at this time as these drug uses are off label and dosing strategies are inconsistent between provides. It is very important

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to consider drug-induced causes of pancreatitis when treating pancreatitis and to consider potential adverse effects of hormone therapy for transgender patients.

Methods:

Results:

Conclusion:

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Descriptive Report

Session-Board Number: 28-M

Poster Title: Adherence assessment via proportion of days covered (PDC) among a national network of health system specialty pharmacies

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Purpose: Non-adherence to specialty treatments for illnesses such as cancer and multiple sclerosis (MS) can have a significant impact on morbidity, quality of life and overall cost of care. An imperative part of health system specialty pharmacy is comprehensive therapy management services including adherence assessment. Excelera is a national network of over 20 health systems that operate their own specialty pharmacies (SPs). Excelera created a data reporting platform through which all members submit data. The specialty dispense data is used for calculations such as proportion of days covered (PDC), which is reported back to members to assess adherence.

Methods: The data sent to Excelera serves several functions, including allowing a standardized calculation for PDC at both the individual member and entire Excelera network levels. Dashboards were created to allow members to assess their individual SP program's quality of care against published (if available) benchmarks for adherence as well as against the average network performance. Therapeutic level network PDC goals and stretch goals were established. A culture of performance improvement has been created through sharing of best practices, which has been facilitated through the Excelera Clinical Committee, consisting of representatives from the clinical teams at each of the member SPs. This culture creation has also been facilitated through Excelera's periodic business reviews with members' SP leadership, operations and clinical staff.

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Results: The aggregated data established through this process allowed for a retrospective analysis of PDC data representing several specialty disease states across the Excelera network of health system SPs. Therapeutic categories include: Cystic Fibrosis, Growth Deficiency, HCV, HIV/AIDS, Hyperlipidemia, Inflammatory conditions, MS, Oncology, PAH and Transplant. Members can assess their PDC on a specific therapeutic and drug level and hone in on potential reasons for non-adherence as needed. For example, the network average PDC for oncology medications went from 84% (2016) to 86% (2017) to 88% (2018). Members are also able to share their strategies for reaching PDC adherence goals with the network.

Conclusion: Providing a systematic process for reporting PDC on a scheduled cadence allows specialty pharmacists to assess adherence on a regular basis and to make appropriate therapy management changes as needed, while at the same time, sharing best practices around adherence strategies.

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Descriptive Report

Session-Board Number: 29-M

Poster Title: Implementation of an enhanced recovery after surgery (ERAS) protocol for abdominal surgeries

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Purpose: Abdominal surgical procedures are difficult to manage and are often correlated with challenging and painful recovery periods. Enhanced recovery after surgery (ERAS) protocols have been implemented at institutions to improve patient recovery time from stress and physiologic changes that occur during surgery. By focusing on specific phases of the perioperative process, ERAS protocols have the potential to improve patient safety and postoperative outcomes, particularly for abdominal procedures, which are commonly invasive with long recuperation time.

Methods: Previously established protocols and surgical recovery strategies were evaluated to establish a baseline protocol. Innovative pain management methods as well as standard patient utilization of pain medications after abdominal surgeries were also considered. Surgical factors, body physiology, and observed patient recovery schedules were assessed. A protocol was created for patients undergoing abdominal procedures with a focus on improving patient satisfaction and clinical outcomes. The protocol was formulated in effort to optimize the pre-, intra-, and postoperative phases of the surgical process with an aim on improving postoperative recovery and pain management. Patients undergoing general abdominal surgical procedures would be eligible for protocol participation.

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Results: The pre-operative phase focuses on patient protocol education and optimizing protocol medications based on a patient's comorbidities. Preoperative orders to preemptively combat surgical stress include consuming 20oz of Gatorade two hours prior to surgery, pregabalin 75mg PO once, celecoxib 400mg PO once, acetaminophen 1000mg PO once, and oxycodone ER 10mg PO once. The intraoperative phase focuses on limitation of fluid and opioid administration, maintenance of normothermia, as well as administration of unique non-opioid pain management. Intraoperative medications will include either a bupivacaine epidural or a transversus abdominus plane block containing dexamethasone, bupivacaine, and clonidine. Ketamine will be administered to the patient in a 1 mg/kg bolus dose, followed by a continuous 0.1mg/kg/hr infusion which will continue throughout the case and PACU stay. The postoperative phase focuses on multimodal pain management, early ambulation, and diet advancement liberalization. Medications for the postoperative phase include scheduled acetaminophen 1000mg PO and ketorolac 15mg IV doses, and breakthrough pain management with oxycodone PO 5 mg. Diet and ambulation will be advanced throughout the first few days of the postoperative period; from a clear liquid diet and one ambulation on post operative day zero, to a regular diet and three ambulations on postoperative day one.

Conclusion: An enhanced recovery after surgery protocol for abdominal procedures was created to improve patient recovery in the areas including, but not restricted to, length of stay, pain management, and return to normal physiologic functioning.

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Submission Category: Critical Care

Poster Type: Descriptive Report

Session-Board Number: 30-M

Poster Title: Characterization of benzodiazepine infusions as appropriate or inappropriate among mechanically ventilated patients at a community hospital

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Purpose: The Society of Critical Care Medicine (SCCM) emphasized on the integrated approach to assessing, treating and preventing over or under sedation in critically ill patients. These Pain, Agitation and Delirium (PAD) guidelines from SCCM have a conditional recommendation in 2018 stating that “non-benzodiazepines sedatives (propofol or dexmedetomidine) may be preferred to sedation with benzodiazepines (midazolam or lorazepam) to improve clinical outcomes in mechanically ventilated patients. In this study, we aim to evaluate the adherence to 2018 PAD guidelines regarding the choice of sedative agent in patients who are mechanically ventilated in the intensive care unit (ICU) at the community hospital.

Methods: In this retrospective single-center cohort study, we evaluated the appropriateness of initiating benzodiazepine infusion in mechanically ventilated patients at a community, non-teaching hospital. The hospital has 32 intensive care beds including medical, surgical, neuro, cardiovascular and cardiology critically ill patients. This study included patients who were mechanically ventilated and initiated on benzodiazepine infusion from January 2018 to December 2018. This analysis randomly sampled 15 patients pilot data collection. Study data included age, diagnosis at admission, Richmond Agitation Sedation Scale (RASS) goals documented, maximum pain score documented, presence of delirium according to Confusion Assessment Method for the ICU, choice of sedative, and choice of analgesia. The type of benzodiazepines and duration of use were recorded. The primary endpoint was appropriateness (appropriate versus inappropriate) of the benzodiazepine infusion based on the presence of a compelling indication for therapy as recommended by SCCM guidelines.

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Appropriate indications for benzodiazepine infusion included active management of alcohol withdrawal, benzodiazepine withdrawal, status epilepticus, agitation that was refractory to at least one first line sedative (dexmedetomidine or propofol), or concurrent administration of a neuromuscular blocking agent.

Results: A total of 81 patients received orders for benzodiazepine infusions during the study period, and 15 patients were randomly sampled for this analysis. The average age was 52 years (standard deviation equals 17.4), and 53 percent were men. The benzodiazepine infusion that ordered was midazolam for 14 patients and lorazepam for one patient. The benzodiazepine orders were active for 46.9 hours (standard deviation equals 42.2). Of the 15 patients analyzed, the benzodiazepine infusion was started in 14 (93 percent). Among the 14 patients who started the benzodiazepine infusion, the duration of infusion was 41.9 hours (standard deviation equals 39.1). Only five patients (33 percent) had a compelling indication for the benzodiazepine infusion order, which included treatment of seizure (n equals 4) and alcohol withdrawal (n equals 1).

Conclusion: Benzodiazepine based sedation has been associated with poor clinical outcomes in multiple published randomized controlled trials and is not recommended by current guidelines unless the patient has a compelling indication. During this pilot analysis, the majority (67 percent) of patients who received orders for a benzodiazepine infusion did not have a compelling indications for that choice of sedative. Additional data will be collected on a larger sample of patients to further describe this potential medication safety issue by further describing provider practices at this community hospital.

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Submission Category: Critical Care

Poster Type: Evaluative Study

Session-Board Number: 31-M

Poster Title: Impact of protocolized sleep improvement with early mobilization utilizing fitness watch technology in the intensive care unit

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Purpose: Sleep quality of patients in the intensive care unit (ICU) is widely considered poor by many experts who have characterized poor quality sleep as an important source of ICU-related anxiety and stress. Polysomnography, the gold standard for sleep measurement, poses challenges that make it difficult to adapt widespread use in the ICU setting. Using a validated surrogate such as the Richard Campbell Sleep Questionnaire (RCSQ) in addition to objective tools may provide further validation of alternative technologies such as fitness watches.

Methods: This Institutional Review Board approved prospective study included patients ≥ 18 years old spending ≥ 1 night admitted to the medical or cardiac ICU 12/2017-1/2019 at a large community hospital. Patients provided informed consent. Patients were excluded if on continuous sedation, expected mortality ≤ 24 hours, history of sleep apnea, contact precautions, unable to place watch due to IV access, pregnancy, known latex allergy, serious auditory or visual disorders, and self-described insomniacs. Patients received clinician determined measures for non-pharmacologic and pharmacologic sleep and mobility promotion. Sleep quality, duration, and stages were tracked via a fitness watch (Fitbit Charge2®) and patients completed a RCSQ daily. Baseline demographics collected included gender, age, daytime sleepiness through the Epworth Sleepiness Scale, ICU and hospital lengths of stay, deliriousness

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medications used, and daily steps. Study endpoints were perceived sleep quality and duration and stages of sleep.

Results: Fifty patients were enrolled. There was an association between all RCSQ groups (poor 0-33, fair 34-66, good 67-100) regarding perceived sleep and time duration of each phase. For poor sleepers (n=16), median [IQR] total minutes (min) asleep and REM sleep per night were lowest at 203.5 min [136-336] and 0 min [0-20], respectively. For fair sleepers (n=23), median [IQR] total min asleep and REM sleep per night were 309.6 min [215-407.1] and 6.3 min [0-23.25], respectively. For good sleepers (n=11), their median [IQR] total min asleep and REM sleep per night were highest at 335 min [294-432] and 9.7 min [1.5-26.25], respectively. The steps per group had an inverse relationship with the median steps [IQR] per day of 560 [154-1271], 484 [151-839], and 343.5 [264-502] for poor, fair, and good sleepers, respectively.

Conclusion: An association between all groups regarding perceived sleep and time duration of each phase indicates some aspect of correlation between perceived sleep and accuracy of fitness watch tracking. These devices may be a reliable future tool for hospitals to more easily track progress in improving patient sleep. Future directions include completing a second phase for comparison with 50 patients implementing pharmacist recommendations on environmental, pharmacologic, and non-pharmacologic interventions such as orientation to day/nighttime, eye masks, earplugs, sound machines, and minimal sleeping interruptions. Comparing groups will aim to determine impact of these interventions on delirium rates, sleep quality, and duration.

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Submission Category: Drug Information/Drug Use Evaluation

Poster Type: Evaluative Study

Session-Board Number: 32-M

Poster Title: Drug utilization study of statin prescribing and adherence among Latino patients with diabetes

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Purpose: Type 2 Diabetes Mellitus is often a risk factor for developing cardiovascular disease (CVD). Current guidelines recommend initiating statin therapy in diabetic patients who are ≥ 40 years of age. Unfortunately, there is lack of consensus amongst primary care physicians (PCPs) to prescribe and poor patient adherence to comply with statin therapy for CVE prophylaxis. This study seeks to estimate the prevalence of diabetes among the Latino population, determine the portion of the population who have been prescribed a statin and who are adherent to the therapy in order to identify issues of both PCP and patient noncompliance.

Methods: This study follows a descriptive study design using data from beneficiaries of a Latino-based pharmacy benefit manager (PBM) with continuous enrollment from January 1, 2018, to October 31, 2018. Diabetes beneficiaries were defined as those with at least two generic product identifiers (GPIs) for a diabetic agent during the study period. GPIs for statin products were used to estimate the prevalence of statin prescribing among diabetic beneficiaries. Proportion of days covered (PDC) was used to estimate diabetic beneficiaries' adherence to the statin therapy.

Results: The prevalence of diabetes among beneficiaries of the PBM aged 40-75 was 6% (6,243/111,572). The mean age for the diabetic beneficiaries was 55 ($SD \pm 7$), and 53% were males. A total of 3,401 (54%) diabetic beneficiaries received at least one prescription for a statin during the study. Among those diabetic beneficiaries who received at least one prescription for a statin during the study period, 1,932 (57%) had $PDC \geq 80\%$.

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Conclusion: Although treatment guidelines recommend placing diabetic patients ≥ 40 years of age on a statin, this study found suboptimal prescribing among Latino diabetic patients. In addition, among those Latino diabetic patients who received at least one prescription for a statin, the adherence levels to the statin pharmacotherapy were suboptimal. Therefore, prompting a bigger issue addressing poor adherence by means of intervention through educating physicians and patients.

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Submission Category: Drug Information/Drug Use Evaluation

Poster Type: Evaluative Study

Session-Board Number: 33-M

Poster Title: Palatability comparison of pre-flavored vancomycin oral solution kit versus traditionally compounded vancomycin oral solution: a randomized crossover study

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Purpose: Oral vancomycin is recommended as first-line treatment for *Clostridium difficile*-associated diarrhea. Vancomycin capsules may not be accessible to some patients due to cost barriers and may be difficult to swallow for some patient populations. Pharmacies have compounded oral vancomycin solution using vancomycin powder for injection and sterile water, a preparation associated with bitter taste. Flavoring the compounded solution is not standardized and often lacks stability assessment. A vancomycin oral solution kit, containing pre-flavored grape diluent and pre-weighed vancomycin hydrochloride powder, with an established stability, has been developed. This study compares palatability of the oral solution kit with the compounded solution.

Methods: This randomized, double-blind, crossover study assesses palatability of two 50 mg/mL oral vancomycin solution formulations (pre-flavored vancomycin oral solution from vancomycin oral solution kit and vancomycin oral solution from vancomycin powder for injection in sterile water). Healthy adults from ages 18 to 65 years were eligible to participate. All participants signed an informed consent form and the study protocol was approved by the Institutional Review Board.

A registered pharmacist prepared 10 mL of each vancomycin formulation for each participant, dispensed via a 15 mL opaque bottle. The sequence of administration of test material and assessment was based on a randomization schedule generated by the testing facility.

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Participants were instructed to swish 10 mL of liquid vancomycin solution in their mouth for 2-3 seconds and spit contents. Participants were asked to evaluate their overall impression of the test material, based on initial taste and aftertaste, color, smell, and texture using a 5-point Likert scale (1=totally repulsive and 5=really yummy). An additional questionnaire assessed a participant's level of agreement with specific statements regarding the taste, aftertaste, color, texture, and smell of the two test materials. After completing the questionnaires, participants were provided water and unsalted crackers to neutralize flavors in the mouth. Participants waited at least 10 minutes prior to proceeding to the second test material assessment. Within-groups and between-groups statistical analyses were conducted on questionnaire data.

Results: Sixty-one healthy adults were enrolled and completed the study. The mean overall impression score, a composite rating of taste/aftertaste, color, texture, and smell, for pre-flavored vancomycin oral solution from kit was 3.66 (SD 1.06) versus 1.80 (SD 0.85) for vancomycin hydrochloride powder for injection in sterile water, p value less than 0.001 (5-point Likert scale, 1=totally repulsive and 5=really yummy). Forty-five (74 percent) participants agreed that the kit had an appealing overall flavor, versus 9 (15 percent) for comparator, p value less than 0.001. Fifty-eight (95 percent) participants preferred the kit versus 3 (5 percent) for comparator, p value less than 0.001.

Conclusion: Pre-flavored vancomycin oral solution reconstituted from the kit tastes significantly better than solution compounded from vancomycin powder for injection in sterile water. The palatability of the vancomycin oral solution kit may improve compliance, especially in patients who are unable to swallow capsules and/or do not have access to capsules. The pre-flavored vancomycin oral solution kit was approved by the FDA in January 2018. The commercial availability of the approved, pre-flavored kit supports the standardization in the formulation and the preparation of vancomycin oral solution across pharmacy practice settings, especially during transition of care settings.

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Submission Category: Drug Information/Drug Use Evaluation

Poster Type: Evaluative Study

Session-Board Number: 34-M

Poster Title: Vasopressin medication use evaluation in adult intensive care units of a tertiary academic medical center

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Purpose: Vasopressin is currently one of the most costly inpatient medications at our institution, with annual expenditure totaling almost 1.5 million dollars in 2016. Anecdotally, pharmacists observed an unusual amount of returns and unnecessary dispensed bags, as well as variability in vasopressin ordering and discontinuation. Due to the rapidly escalating cost of vasopressin, a pharmacy and therapeutics committee approved evaluation of vasopressin ordering, dispensing, and administration practices was conducted.

Methods: A retrospective report from our electronic medical record was generated to display all vasopressin orders from October 5, 2017 through November 3, 2017, along with corresponding override pull data from automated dispensing cabinets. 153 unique patients and 248 orders were reviewed. Inclusion criteria were for adult patients within intensive care units who were ordered for vasopressin for vasodilatory shock. The primary outcome was to determine duration of vasopressin infusions. Other secondary outcomes included norepinephrine equivalent dose at vasopressin initiation, starting dose of vasopressin, whether vasopressin was titrated, and if vasopressin was weaned prior to other vasopressors. In addition, quantity of mixtures dispensed, waste, and medication override data was collected. Based on institution policy, this evaluation is considered quality improvement and is not subject to institutional review board review.

Results: 102 patients met inclusion criteria, and of these patients, 92 had documented vasopressin administration. The median duration of vasopressin infusion was 15.25 hours

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(interquartile range 3.75, 35.9 hours) with central concentration mixtures, and 3.3 hours (interquartile range 0, 15.3 hours) for peripheral mixtures. The mean vasopressor dose at vasopressin initiation was 17 micrograms per minute of norepinephrine dose equivalent. Initial starting dose of vasopressin was 0.04 units per minute. 70 percent of orders utilized flat rate dosing; cardiac surgery and surgical trauma intensive care units tended to more frequently utilize titratable vasopressin dosing. In 44 percent of patients, vasopressin was weaned or stopped before other vasopressors were weaned. A total of 253 vasopressin mixtures were dispensed, with 169 new medication administrations recorded, and 84 mixtures that were wasted or returned to the pharmacy. During this time period, 81 vasopressin vials were overridden by nursing staff, and 115 vials were restocked by the pharmacy to the automated dispensing cabinets. Override pulls were reviewed, and the sole indication was to make vasopressin infusions – no patients received vasopressin for cardiac arrest.

Conclusion: Dosing and prescribing of vasopressin should be optimized to reflect current practice and literature, by adjusting the dosing for septic shock to a standard range order of 0 to 0.03 units per minute, with titration and weaning protocols. The primary mixture used is a 50 unit in 50mL infusion syringe, which lasts 27 hours; implementing smaller volume mixtures and utilizing ASHP Standardize 4 Safety concentrations would result in less waste. 33 percent of mixtures were wasted; correlating with override pulls, mixtures were made prior to pharmacy mixture delivery. Further recommendations were made to evaluate override pulls and automatic dispensing functionality.

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Submission Category: Geriatrics

Poster Type: Descriptive Report

Session-Board Number: 35-M

Poster Title: Impact of a pharmacy deprescribing service on select drugs to avoid in the elderly

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Purpose: The “Beers Criteria for Potentially Inappropriate Medication Use in Older Adults” is a helpful tool for healthcare providers to identify possible medication safety concerns and opportunities to improve healthcare outcomes. In 2015, Kaiser Permanente Riverside Service Area implemented an ambulatory care pharmacist deprescribing service for select high risk drugs to avoid in the elderly. Pharmacists educate physicians and patients about the safety concerns of the medication, offer alternative safer therapies, and may taper or discontinue the medication through physician approval. The study analyzed the effectiveness and clinical outcomes of this pharmacist-led deprescribing service for drugs to avoid in the elderly.

Methods: The institutional review board approved this retrospective data only study conducted within the Kaiser Permanente Riverside Service Area. The objective of the study was to determine whether pharmacist deprescribing interventions have any impact on drug utilization and prevention of drug specific adverse events in the elderly. The study population included patients > 65 years old with an active prescription(s) for estrogens, non-benzodiazepine sedative hypnotics (NBZD-SH), skeletal muscle relaxants (SMR), and/or a tricyclic antidepressant (TCA) between January 1st, 2016 to December 31st, 2017. Patients were excluded if in hospice care or lost Kaiser Permanente insurance coverage. The index date was the first documented ambulatory care pharmacist outreach call or message to the physician or patient. Patients served as their own control. The primary outcome was to determine any difference in drug specific adverse events (ADE) 12 months pre- and post-pharmacist outreach. A statistical paired t-test analysis was conducted to measure these results. Additional study outcomes identified the prescriber acceptance, discontinuation, and recidivism rates within 12 months post-

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pharmacist outreach. Outcomes of the study were also compared between patients that did not discontinue the high-risk medication, those that discontinued but restarted the medication, and those that successfully discontinued the medication, defined as discontinuing the prescription without restarting therapy 12 months post-pharmacist outreach.

Results: A total of 795 patients were included in this study: estrogens (n=317), NBZD-SH (n=116), SMR (n=191), TCA (n=171). The prescriber acceptance rate was: estrogen 74%; NBZD-SH 85%; SMR 97%; TCA 96%. The discontinuation rate was: estrogen 39%; NBZD-SH 52%; SMR 81%; TCA 95%. The recidivism rate was: estrogen 8%; NBZD-SH 10%; SMR 13%; TCA 3%. There was no statistically significant difference in the ADE rate post-pharmacist outreach for any of the drug classes, whether the medication was successfully discontinued, not discontinued, or discontinued but restarted. For patients that successfully discontinued the high-risk medication, the mean difference pre- and post-outreach was: estrogen (-0.64, p-value 0.06); NBZD-SH (-0.07, p-value 0.43); SMR (0.8, p-value 0.16); TCA (-0.07, p-value 0.26). In patients that did not discontinue the medication, the mean difference was: estrogen (0, p-value null); NBZD-SH (-0.06, p-value 0.71); SMR (0.4, p-value 0.48); TCA (0, p-value null). In patients that restarted the medication the mean difference was: estrogen (0, p-value null); NBZD-SH (0, p-value null); SMR (0.04, p-value 0.81); TCA (0.4, p-value 0.18).

Conclusion: Pharmacists were successful in discontinuing high-risk medications in the elderly. Deprescribing efforts did not affect the number of drug specific adverse events that occurred, however this may be due to a short follow up period of 12 months. Further study with a larger sample size over a longer period (> 2 years) for each drug class is needed in order to determine if there is any statistical difference in ADEs after pharmacist outreach and discontinuation of the medication.

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Submission Category: Infectious Diseases/HIV

Poster Type: Evaluative Study

Session-Board Number: 36-M

Poster Title: An assessment of the possible utility in the implementation of a clinical decision support system to direct the appropriate antibiotic therapy in pneumonia treatment

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Purpose: The implementation of a pharmacy-managed Clinical Decision Support System (CDSS), for antimicrobial regimens in the treatment of pneumonia, will allow for evidence-based therapies to be readily accessible for physicians to utilize. The objective of this study was to determine the possible value in the implementation of a CDSS to aid in the selection of antimicrobial regimens in the treatment of pneumonia and whether it would decrease patient length of hospital stay.

Methods: This study was submitted to the Institutional Review Board for approval. Participants included patients at an urban hospital. This project was separated into two separate phases. In phase I the charts of the patient's diagnosed with pneumonia, as captured by ICD 10 codes, from the months of March 1st, 2017 to September 1st, 2017 were evaluated. Following the collection of said patient's charts, the antimicrobial regimens were assessed for appropriateness in relation to the evidence-based antimicrobial regimens suggested by the Infectious Diseases Society of America (IDSA) guidelines. Following the assessment of the therapies, the patient length of stay will be documented. In Phase II of the study, based upon the results of Phase I, the clinical decision support system (CDSS) for the treatment of pneumonia, to be implemented via the hospital's computer program, Cerner Soarian, will be proposed to the Pharmacy and Therapeutics committee. Patients diagnosed during the months of January 1st, 2018 to January 1, 2019 will be evaluated.

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Results: Following the assessment of phase 1, 41 total patients were documented as being treated for community-acquired pneumonia that and placed in the intensive care unit (CAP-ICU), 78% of the patients (32/41) were treated in accordance with the IDSA guidelines. 36% (19/53) of the patients treated for CAP, and were not assigned to the ICU were treated in accordance to the IDSA guidelines; while 57.5% of the combined patients treated for ventilator-associated pneumonia (VAP) and hospital-associated pneumonia (HAP) were treated in accordance with the IDSA guidelines (13/25 and 10/15, respectively). The average stay of those patients that were treated in accordance to the guidelines was totaled to be 3.5 days, while the average days of those patients that were not treated in accordance to the guidelines were increased at 7 days.

Conclusion: As shown through this study, the implementation of a CDSS would be integral in providing patients with IDSA directed therapy, which would have positive effects on decreasing patient length of stay. The approval of the CDSS by the Pharmacy and Therapeutics committee attests to the support system's certain utility upon integration. Furthermore, this study demonstrates how imperative pharmacists are in the progression of proper antimicrobial allocation and ultimately stewardship.

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Submission Category: Infectious Diseases/HIV

Poster Type: Evaluative Study

Session-Board Number: 37-M

Poster Title: Impact of HIV and chronic kidney disease comorbidities on hepatitis C treatment choices, drug-drug interactions and hepatitis C cure

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Purpose: HIV co-infection and chronic kidney disease (CKD) add challenges to Hepatitis C virus (HCV) treatment. This study aimed to conduct a comparative study of treatment choices, drug-drug interactions and clinical outcomes in HCV mono-infected patients, or those with HIV or CKD comorbidities.

Methods: An observational study was conducted analyzing datasets of all HCV patients that were referred to a large tertiary Liver Unit in the West Midlands, UK between July 2015 and January 2018. Patients aged ≥ 18 years with diagnosis of hepatitis C alone or co-infected with HIV or comorbid with CKD were eligible. The treatment choices, relevant potential drug-drug interactions (DDIs) and sustained virologic response 12 weeks post end of treatment (SVR12) were assessed.

Results: Out of 313 patients, 154(49.2%) were HCV mono-infected, 124(39.6%) HCV/HIV co-infected and 35(11.2%) were HCV/CKD comorbid. There were 151(98.1%) of HCV monoinfected, 110(88.7%) of HCV/HIV and 20(57.1%) of HCV/CKD patients treated with 1st line regimens. Significantly more patients who had co-morbidity with either HIV or CKD were prescribed 2nd line regimens (8.1% and 37.1% respectively), compared to patients with HCV monoinfection (1.9%) (P-value < 0.05). Comorbid patients (12.1% of HIV and 25.8% of CKD) were

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more likely to required DDIs advice (grade 5) than HCV mono-infected (1.8%). Higher cure rates were observed in HCV monoinfected (95.33%), HCV/HIV (96.12%) compared to HCV/CKD patients (90.32%).

Conclusion: This study shows that treatment pathways permitting access to individual treatment adjustments in accordance with comorbidities and with consideration of drug-drug interaction, provides successful outcomes in HCV patients co-morbid with HIV or CKD.

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Submission Category: Infectious Diseases/HIV

Poster Type: Evaluative Study

Session-Board Number: 38-M

Poster Title: The impact of antimicrobial stewardship program pre-authorization strategy on the consumption of restricted antimicrobials at tertiary hospital

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Purpose: Antimicrobial stewardship program was implemented since August 2016. This study was conducted to evaluate the antimicrobial stewardship program and appropriate use of these agents using clinical and quality indicators.

Methods: Consumption data of the antibiotics under investigation was collected using pharmacy department monthly issuance electronic records. The data was analyzed to determine the consumption trend (primary endpoint) before implementation of the ASP pre-authorization strategy (pre-intervention) this include the years 2015 and 2016. The post-intervention period include the years 2017 and 2018. The cost of the used antimicrobial over the study period was also determined (secondary endpoint). The change in antibiogram and resistance pattern was also evaluated.

Results: The results showed decrease in the use of tigecycline by 31% and 25% in the years after the ASP pre-authorization strategy implementation. The antifungal voriconazole consumption was reduced by 52%.

Significant reduction in antimicrobial cost was observed in particular the cost of expensive agents such as linezolid, tigecycline, and voriconazole. The multidrug resistance isolated organisms were significantly decreased. The resistance pattern as shown in the 2018 decreased compared with 2017.

Conclusion: The antimicrobial stewardship program (ASP) pre-authorization strategy significantly reduced the consumption of antimicrobials guarded by the pre-authorization

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policy. The ASP strategy did not worsen patient outcomes and contributed in the cost reduction as well. The use of clinical and quality indicators was successful to evaluate antimicrobial stewardship program.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 39-M

Poster Title: Impact of computerized prescriber order entry (CPOE) and unit dose system (UDS) on waiting time, medication errors and cost saving at a tertiary care hospital

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Purpose: Missing doses and Medication Administration Records (MARs), long Turn Around Time (TAT), missing patient information, use of abbreviations and wastage were among many challenges inpatient pharmacy was facing while using traditional distribution system in a tertiary care hospital in Saudi Arabia

As an initiative for continuous quality improvement in the delivery of pharmaceutical care services, a team was formed from pharmacy, nursing, medical and Information Technology (IT) departments. The aim was to implement Computerized Prescriber Order Entry (CPOE) and Unit Dose System (UDS) in the inpatient setting to decrease medication errors and save cost while decreasing TAT.

Methods: This pre-post interventional study was carried out in the inpatient pharmacy of King Fahad Armed Forces Hospital (KFAFH), a 800-bed capacity tertiary referral hospital in Jeddah, Saudi Arabia. The aim of this study was to measure the impact of implementing CPOE and UDS in decreasing medication errors and cost saving while decreasing TAT.

A team was formed from pharmacy, nursing, medical and Information Technology (IT) departments. After several meetings a plan was drawn to implement the changes gradually in each floor at a time. During implementation the team was available all the time to support the system and help to overcome any expected resistance and system failures.

Waiting time or TAT was measure before implementation by manually recording the time from writing the order on MAR to receiving the medication by nursing station. After implanting CPOE and UDS the measure of waiting time was measured electronically from entering the order to

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the delivery of medication. Medication errors was measured by counting the number of errors per month before and after implementing CPOE and UDS. Cost of medication was measured using the cost of pharmaceutical warehouse deliveries before and after implementation.

Results: Quality improvement measures were improved after pharmacy informatics intervention. After implantation of CPOE and UDS, TAT decreased significantly from an average of 78.6 (SD \pm 7.6) minutes to 15.9 (SD \pm 5.0) minutes with 80.8% reduction in waiting time. Medication error rate was decreased from 42 errors per month to 16 errors per month with 61.9% reduction in error rate. Cost of medication delivered to inpatient pharmacy was decreased from 15.6 million dollars to 10.9 million dollars with cost saving of 4.7 million dollars.

Conclusion: In KFAFH hospital in Jeddah Saudi Arabia, implementation of CPOE and UDS resulted in decreasing TAT significantly while decreasing medication errors and generated substantial cost saving.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 40-M

Poster Title: Lipidomic analysis of the effects of melittin on human ovarian cancer cells using mass spectrometry

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Purpose: Lipids help to maintain the integrity of cells, which is the reason for their association with cancer. We hypothesized that the difference in lipid content of ovarian cancer cells sensitive and resistant to cisplatin might be a useful indirect measure of a variety of functions coupled to ovarian cancer progression.

Methods: To evaluate the effect of a melittin, a cytotoxic peptide from bee venom with known effects on cell membranes, on the lipid composition of ovarian cancer cell lines A2780 (cisplatin-sensitive) and A2780CR (cisplatin-resistant) a liquid chromatography-mass spectrometry coupled to an Orbitrap Exactive mass spectrometer using an ACE silica gel column was employed. . The A2780 and A2780CR cells were treated with 6.8 and 4.5 µg/mL of melittin, respectively. Data extraction with MZmine 2.10 and database searching were applied to provide metabolite lists. PCA and OPLS-DA models were used to assess the different profiles of the lipid composition obtained from the two cell lines. Both models gave clear separation between the treated and untreated samples.

Results: In our study, phosphatidylcholine (PC) was the most abundant lipid class in both cell lines, followed by phosphatidylethanolamine (PE), and sphingomyelin. We found a higher level of lipids in ovarian cancer cells sensitive to cisplatin as compared to the resistant cells. Differences in the levels of lysoPC 16:0 and 18:0 were non-significant between cell lines. The changes induced by melittin in both cell lines led mostly to decrease the level of PC and PE lipids. However, the LysoPC level was increased in both cell lines after melittin treatment.

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Conclusion: The results of the present study show that lipids were significantly altered in both A2780 and A2780CR cells. The observed effect was much more marked in the cisplatin-sensitive cells, suggesting that the sensitive cells undergo much more extensive membrane re-modelling in response to melittin in comparison with the resistant cells.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 41-M

Poster Title: Optimization of community care prescription process

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Purpose: The objective of this quality assurance project is to analyze community care, known as the Choice program, prescription order entry and assess the utility of implementing an electronic prescription system to streamline community care prescription processing. Currently at our facility, non-VA providers must fax prescriptions rather than electronically enter via our local computerized physician order entry (CPOE) system. Faxed prescriptions are subsequently collected, entered, and verified by pharmacists through our electronic health record. During this process, pharmacists must scan physical copies of prescriptions for record-keeping as well as communicate with providers via fax and phone if further clarification is needed.

Methods: This quality assurance project is a retrospective analysis of VISN 22's power-pivot library of the Choice prescription program. Data collected through this library includes the number of prescriptions filled by year and stratified by month, trend of new prescriptions and new providers over time, and prescription fills stratified by medication type. A time and motion analysis was performed to assess efficiency of the current community care prescription process. Aspects of the prescription process evaluated include time spent searching for, entering, verifying, and scanning community care prescriptions. Secondary information collected includes prescription number, medication name, need for provider follow-up, and type of community care prescription.

Results: Since 2016, there has been an upward trend in community care fills and new prescriptions. The most common medication classes processed for community care prescriptions are antidepressants (9715 total fills), sedatives/hypnotics (4530 total fills), and

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dermatological agents (1519 total fills). Of those medication types, the most common of each class were Bupropion, Alprazolam, and Clobetasol with 462, 244, and 138 fills respectively.

Conclusion: VA San Diego Healthcare System would benefit from implementing an electronic prescription process. Following the establishment of the Veterans Choice Program, the breadth of community care accessible to veterans was greatly expanded to better address their health. As the number of prescriptions continues to trend upward, it would be prudent to implement a system to decrease pharmacist time spent doing manual tasks, such as retrieving faxes or scanning physical copies of prescription forms.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 42-M

Poster Title: Cost-effectiveness of technology assisted medication picking versus traditional manual picking in a hospital outpatient pharmacy

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Purpose: Medication errors have been associated with increased morbidity and mortality, contributing significantly to unnecessary healthcare spending. While automated systems have been identified as a potential solution for reducing medication errors and near misses, a concurrent manual picking component is often still necessary, posing as a potential source of error. To address this, we implemented two different technologies to facilitate manual picking of medications - the light-emitting diode (LED)-guided and the Smart Bin systems. Our study sought to evaluate the effectiveness of these medication picking systems in reducing near misses, as well as cost-effectiveness and affordability compared with traditional manual picking.

Methods: This was a retrospective observational study conducted at three outpatient pharmacies of a 1,800-bed tertiary referral hospital in Singapore between September 2017 and June 2018. The LED-guided and Smart Bin systems were implemented to assist with manual medication picking at two of the pharmacies in 2012 and 2016 respectively. The third pharmacy uses traditional manual picking stations and is the comparator in our study. We excluded data for medications stored in the refrigerator and the controlled drug cabinets since the medication picking systems were not implemented in these areas. Our study uses the definition of "near miss" as defined by the Institute for Safe Medication Practices, which refers to an error that has the potential to cause harm, but does not reach the patient due to chance, or because it is intercepted. Anonymized data on all medications picked and near misses reported during the

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study period were retrieved from an electronic database. Descriptive statistics were used to summarize medication near miss rates. We compared the incidence of medication near misses for the LED-guided and Smart Bin systems relative to traditional manual picking using binary logistic regression. We compared annual operating costs between medication picking systems and reported incremental cost-effectiveness ratio (ICER) per near miss avoided to evaluate cost-effectiveness of each system.

Results: Throughout the study period, 358,144, 397,343 and 254,162 medications were picked by traditional manual picking, LED-guided and Smart Bin systems respectively. A total of 298, 162 and 17 near misses were reported in the traditional manual picking, LED-guided and Smart Bin systems respectively. This corresponded to a near miss incidence of 8.32, 4.08 and 0.69 per 10,000 medications picked for the traditional manual picking, LED-guided and Smart Bin systems respectively. Medication near miss rates were significantly lower for the LED-guided (OR 0.49, 95% CI 0.40-0.59, $p < 0.001$) and Smart Bin (OR 0.08, 95% CI 0.05-0.13, $p < 0.001$) systems as compared with traditional manual picking. The annual operating cost of traditional manual picking, LED-guided and Smart Bin systems were S\$64,362.82, S\$131,522.70 and S\$153,278.84 respectively. The LED-guided and Smart Bin systems yielded ICERs of S\$184 (US\$136) and S\$136 (US\$101) per near miss avoided respectively compared with traditional manual picking.

Conclusion: Our findings suggest that technology assisted medication picking is effective in reducing medication near misses compared with traditional manual picking, but at a higher cost. The cost-effectiveness analysis showed that both the LED-guided and Smart Bin systems are cost-effective and affordable compared with traditional manual picking, with Smart Bin being the most cost-effective system. The findings will be useful to pharmacy managers and hospital administrators looking to implement similar technology in their medication picking process to improve safety.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 43-M

Poster Title: Decreasing manual entry at the automated compounding device (ACD): an electronic order work-flow for custom pediatric IV fluids reduces transcription errors and increases ACD productivity

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Purpose: Transcription errors are a leading cause of medication errors. Pediatric institutions routinely use an ACD to prepare both Parenteral Nutrition (PN) and custom IV fluids such as those containing amino acids or with final dextrose concentrations >10%. An ACD usually requires manual transcription of the Electronic Health Record (EHR) order. We wished to eliminate this step. During our recent EHR conversion to Epic, direct transmission of electronic PN orders from Epic to the ACD was facilitated with DoseEdge, our sterile products work-flow system. We sought to mirror this work-flow for patient-specific custom IV fluids requiring ACD use.

Methods: Based on the successful PN work-flow, a multidisciplinary task force created a similar work-flow for non-PN IV fluids: Provider enters orders directly into Epic using pre-built entries or IV Infusion Builders customized for ease-of-use. Pharmacist verifies order. Orders requiring pharmacist transcription or manipulation are not allowed (e.g. free text or “dummy” orders). Based on bulk ingredients (Dextrose 70% or Amino Acid 10% Solution), Epic defaults the dispense location to the ACD. Initial compounding begins at a DoseEdge workstation queue located adjacent to the ACD. A preparation label is printed containing a unique order barcode. Upon scanning, the ACD uploads the formula and ingredient amounts directly into the ACD without the need for order transcription. Upon successful pumping of the fluid, the ACD sends

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an electronic report back to DoseEdge conveying pertinent details such as user name, weight variance, ingredient information, and date/time specifics. DoseEdge will prompt if the fluid requires manual addition of any Non-ACD ingredients. The pharmacist performs final verification of the fluid remotely via DoseEdge, with full access to the order, compounding report, and visual pictures of the finished product. Work-flow implementation occurred slowly over four months as issues were resolved. Four month pre and post-implementation data analysis sources included Dose Edge and the Event Reporting system. Outcomes included percent of manually entered fluids, reported errors, and categorization of IV fluid orders.

Results: Pre-implementation, ACD use averaged 121 non-PN fluids/month with 100% manually entry. Over four months of implementation, manual entry decreased monthly (80%,75%,28%,4%). After full implementation, manual entry was <1% with ACD use averaging 567 non-PN fluids/month (460% increase) with a median hourly compounding frequency of every 4 minutes (high) and 1.75 hours (low). Overall ACD use increased due to a change in compounding practice. Post implementation, 451 fluids/month (average) were being rerouted to the ACD (by default or manually by staff) that otherwise would have been compounded traditionally with pre-mixed bags plus manual additive addition, representing 75% of non-PN ACD productivity. ACD non-PN fluid overall breakdown varies as follows: sodium acetate 40-160 mEq/L \pm heparin (32%), sodium chloride 40-160 mEq/L \pm heparin \pm additives (20%), dextrose 5-50% + additives (33%), and any Amino Acid containing fluid (15%). 95% of all non-PN IV fluids made via ACD were for Neonatal Intensive Care (NICU) patients. All IV fluids were properly assigned a Beyond Use Date (BUD) per United States Pharmacopeia (USP) Chapter 797 standards. There were two relevant event reports during the pre-implementation phase compared with no event reports during implementation or post-implementation. Limitations include use of reported events only for error detection.

Conclusion: Electronic order work-flow virtually eliminated manual entry of patient-specific non-PN orders at the ACD, decreasing order transcription error risk. Vendors and institutions should be encouraged to work collaboratively to mirror this work-flow. Unexpected was the increase of fluids compounded at the ACD instead of using commercially available bases with manual additions. Encouragingly, no errors were reported with a 4-fold increase in ACD use. Our institution will take forthcoming USP 797 updates and anticipated BUD changes into account in deciding which fluid orders are most appropriate for ACD compounding. Provider orders should be optimized for proper ACD routing.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 44-M

Poster Title: Use of failure mode and effects analysis (FMEA) to mitigate potential risks prior to implementation of an intravenous compounding technology

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Purpose: Limited literature exists regarding the prospective analysis of potential failure modes for pharmacy technologies. Future implementation of a new to market, intravenous compounding technology in the oncology pharmacy is planned. We describe a deliberate exercise to define the workflow for use, opportunities for error and their risk potential, and system and operational changes to mitigate error risk.

Methods: This quality improvement project was conducted between February 2018 and February 2019. A team consisting of medication safety pharmacists, oncology pharmacists and technicians, the Assistant Director for Informatics and Medication Use Systems, and representatives from the technology vendor completed the FMEA. The FMEA identified areas of risk, evaluated the severity of each failure mode based on clinical and operational impact, identified system and operational changes to minimize risk, and re-evaluated severity risk with execution of the changes. Failure modes were scored using both Risk Priority Number (RPN) and Risk Hazard Index (RHI) scores. RPN values were calculated for each failure mode using the equation: Severity (S) X Frequency (F) X Detection (D) = RPN. The RPN prioritizes the failure modes in order to guide the allocation of resources to address the highest priority failures; higher RPN values indicate higher risk and priority. RHI values were calculated for each failure

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mode using the equation: Severity (S) X Frequency (F) = RHI. Higher RHI values signify severe failures that occur frequently and are considered greater risk (i.e. high risk).

Results: After a product demonstration, the expected workflow was defined in a 41-step process. RPN and RHI scores were identical for each failure mode because all failure modes were considered detectable (score of 1). Overall, 16 failure modes were identified during the FMEA, and five modes were considered highest risk. Three of the five high-risk modes were attributable to user error, and the ability to progress with product preparation is prohibited by the system design. Because the technician encounters a hard stop and cannot proceed, we did not identify actions for these three modes. For the two remaining high-risk failure modes, mitigation strategies and system changes were identified. System changes include clarifying ambiguous terminology within the software as well as implementation of a photo preview option for the technician after he or she photographs the final product and ingredients. Both of these changes are scheduled for the next software upgrade, which is prior to implementation of the technology. The risk associated with the two failure modes is reduced by 33% with implementation of the changes.

Conclusion: A FMEA conducted prior to implementation of an intravenous compounding technology served as a useful tool to establish workflow and identify potential failure modes within the dispensing process. Collaboration among multiple stakeholders effectively identified solutions to reduce the risks associated with the new technology. Use of a proactive approach allowed the vendor to incorporate product changes prior to product implementation, resulting in a safer dispensing process. The design of the FMEA and inclusion of vendor representatives in the work group should be replicated for future analyses.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 45-M

Poster Title: Application of a pharmacy workflow system to the nonsterile environment as a strategy to reduce medication errors and waste

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Purpose: At the University of Virginia (UVA) Health System, we implemented a barcode-enabled workflow management system for preparation of nonsterile patient-specific doses. While previous systems were used exclusively in the preparation and dispensing phases and focused on medication safety and dispensing accuracy, our system also integrates with the medication compounding workflow system for increased safety and accuracy of dispensing compounded medications, and with our cart fill system for increased efficiency and waste reduction. The aim of this study was to examine the effectiveness of a dispense preparation and dispense check system in reducing medication errors and waste in the nonsterile environment.

Methods: This was a retrospective study conducted in an academic, tertiary 612-bed hospital in Virginia. The workflow system was implemented in the nonsterile setting on May 8, 2018. This barcode-enabled workflow management system was applied to medications not dispensed through an automated system with integrated barcode scanning procedure (e.g. carousel), and for which preparation by the pharmacy technician and validation by the pharmacist were previously done manually. The system matches information from either the ingredients used during compounding or the commercially available product with the medication order entered in the electronic medical record (EMR).

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In the 6 months post-implementation (May 8-Nov 8, 2018), the number of eligible prescriptions scanned by the pharmacy technicians and checked by the pharmacist, as well as alerts generated by the workflow management system, were extracted from the EMR. Alerts were grouped into safety- and waste-related. Alerts pertaining to safety comprised issues with the scanned drug being the wrong drug for the order, the wrong strength or being expired; safety alerts for compounded products included additional alerts for the product not having undergone a final pharmacist check, or being expired. Alerts related to order discontinuation, order being completed, or patients being discharged were categorized as ways to reduce medication waste. Descriptive statistics were calculated, with absolute frequencies and percentages presented for categorical variables and means and standard deviations (SD) for continuous variables.

Results: A total of 71,377 nonsterile eligible orders were analyzed, of which 59,761 (83.7%) were prepared by the pharmacist technician in compliance with the barcode-enabled workflow management system (compliance prepare). Among the latter, 90.8% (54,292/59,761) were checked by the pharmacist (compliance check). The barcode scanning system generated 2,531 alerts during the 6-month follow-up period, of which 1,488 (58.8%) were safety-related alerts and 1,043 (41.2%) contributed to medication waste reduction as a result of medicines not being sent to the unit. The total number of alerts generated decreased from 1,155 to 354 between the first and the last month of follow-up. Safety alerts sharply decreased from 1,012 to 93 during the first month and remained low at an average of 95.2 (SD=19.7) per month thereafter. Waste-related alerts generally remained constant during the 6 months following implementation at an average of 177.0 (SD=45.2) per month.

Conclusion: The barcode-enabled workflow management system was implemented successfully in the nonsterile environment at the UVA Health System and contributed to improved medication safety and reduced waste. Continuous improvement should focus on increasing compliance with the barcode system by pharmacy technicians when preparing nonsterile compounding medications and on ensuring that all medications prepared using this system are checked by the pharmacist in the same way.

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Submission Category: IV Therapy/Infusion Devices

Poster Type: Evaluative Study

Session-Board Number: 46-M

Poster Title: Cost-effectiveness of continuous capnography monitoring with PCA pause functionality in the US acute care setting

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Purpose: Respiratory depression (RD), a potentially lethal complication of patient-controlled analgesia (PCA). Respiratory depression may lead to emergency interventions, ICU admissions, preventable deaths, and increased resource utilization. Various methods exist for monitoring a patient's respiratory status and level of sedation: pulse oximetry, capnography, or capnography with 'PCA pause' technology, wherein opioids administered via PCA are discontinued when the monitor detects respiratory depression. Despite the advancements in available technology, no current evidence exists assessing the cost-effectiveness of these various monitoring methods. The objective of this analysis was to assess which method of monitoring was most cost-effective for patients on PCA therapy.

Methods: A decision analysis model was constructed to assess the cost effectiveness of capnography with PCA pause compared to (1) standard monitoring (periodic check-ins with nursing), (2) pulse oximetry (SpO₂), and (3) capnography (EtCO₂) with or without SpO₂. The model evaluated acute care patients on PCA therapy from a hospital perspective and assumed that each technology would have a rate of "RD detection", wherein the technology would sound an alarm when sensing too low of a respiratory rate or oxygen saturation. Possible events occurring from detection of respiratory depression were mild/moderate adverse events or severe adverse events. Mild/moderate events included naloxone administration, rapid response activation, and supplemental oxygen administration. Severe events included those given during mild/moderate events, in addition to intubation and ICU care. The model utilized effectiveness data from published literature and assumed rates of "RD detection" with the

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various monitoring methods. Direct medical costs were utilized in the model and were derived from published literature sources. Base-case estimates were tested for robustness using one-way sensitivity analyses and a probabilistic sensitivity analysis. Incremental cost-effectiveness ratios (ICERs) were calculated comparing PCA pause technology to the other comparators of the model.

Results: Capnography with PCA pause was the most cost-effective intervention modeled within the population of acute care patients, with an incremental cost per event of RD detected of \$25, \$13,171, \$12,618 compared to EtCO₂ with or without SpO₂, SpO₂, and standard monitoring, respectively. The incremental costs derived were primarily driven by a reduction in severe adverse events. In a series of one-way sensitivity analyses, the expected weighted cost for capnography with PCA pause taking into account clinical endpoints ranged from \$1,118 to \$9,520, indicating robustness of the model. The sensitivity analysis results also confirmed that the model was most sensitive to changes in incidence of severe RD events as well as to the cost of capnography with PCA pause technology. The probabilistic sensitivity analysis indicated that capnography with PCA pause dominated as the most cost-effective option in 58.3% of 1,000 microsimulations performed. Using a set willingness-to-pay threshold of \$50,000 per respiratory depression event detected from a hospital perspective, the probabilistic sensitivity analysis predicted that capnography with PCA pause had a 56% probability of being the more cost-effective option compared to the 3 other comparators.

Conclusion: Capnography with PCA pause decreased the likelihood that acute care patients on PCA therapy would experience severe adverse events after the detection of respiratory depression, compared to capnography monitoring, pulse oximetry, or standard monitoring. Capnography with PCA pause was the most cost-effective monitoring method for patients on PCA opioid therapy, with an expected cost per severe RD event detected of \$4,882. The main driver of these cost savings was incidence of severe adverse events after respiratory depression detection.

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Submission Category: IV Therapy/Infusion Devices

Poster Type: Evaluative Study

Session-Board Number: 47-M

Poster Title: Impact of smart pump and electronic health record (EHR) integration on infusion safety

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Purpose: Intravenous (IV) medication administration poses significant safety challenges because IVs require multiple steps for administration and often involve high risk medications. Smart pumps provide safety features for IV infusions including dosing limits which can help prevent medication errors; however, this traditionally requires manual pump programming. Without auto-programming, facilitated by smart pump-electronic health record (EHR) integration, error reduction can be inadequate. The primary purpose of this study was to evaluate medication infusion safety before and after implementation of pump auto-programming.

Methods: This study was conducted by a multidisciplinary team of pharmacists and nurses from June-August 2017 and August-September 2018 at a community healthcare system in San Diego, California. A point prevalence methodology was used to collect infusion data that compared actual medication administration with the electronic order in a wide range of patient care areas including critical care, medical-surgical, orthopedics, post-operative and emergency care. Data collected included medication, concentration, dose, rate of infusion, medication omissions, and EHR documentation accuracy. Medications not administered using smart pumps were excluded. Severity of each error was rated using the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Index for Categorizing Medication Errors. This study was approved by the institutional review board.

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Results: In the pre-implementation period, data was captured for 279 active infusions and a total of 135 errors (48.4%) were observed. The most common types of errors were medication omission (n=43, 31.9%), unauthorized medication (n=26, 19.3%), bypassing drug library use (n=20, 14.8%), and wrong rate (n=13, 9.6%). In the post-implementation period, a total of 289 active infusions were observed and 102 errors (35.3%) were captured. The most common types of errors were medication omission (n=42, 41.2%), unauthorized medication (n=18, 17.6%), documentation error (n=12, 11.8%) and wrong rates (n=10, 9.8%). Among these errors, 27 errors (20.0%) during pre-implementation and 18 errors (17.6%) during post-implementation involved high-risk medications including antiarrhythmics, anticoagulants, electrolytes, insulin, neuromuscular blocking agents, opioids, vasopressors, and parenteral nutrition. Overall, a 27% reduction in errors was seen following the implementation of smart pump and electronic health record integration.

Conclusion: Smart pump-EHR integration resulted in a 27% reduction in medication administration errors. Despite the use of dose error reduction software, medication barcode scanning, and smart pump auto programming during IV administration, errors persisted. Further studies are needed to better understand practice improvement and technology optimization strategies to eliminate the remaining risks associated with infusion administration.

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Submission Category: Leadership Development

Poster Type: Descriptive Report

Session-Board Number: 48-M

Poster Title: Integrated leadership education opportunities for informatics learners

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Purpose: Current practice for developing informatics leaders is either related to formal training or not addressed with enough emphasis during training. Opportunities exist to educate on leadership skills through explanation of real-life, daily experiences that occur in the world of informatics, but these opportunities may not be utilized as often as is possible to foster leadership development. This initiative was designed to integrate leadership teachings before and after informatics experiences in order to provide lasting, concrete leadership knowledge for informatics learners.

Methods: A pharmacist informaticist with advanced training in both leadership and informatics selected leadership topics to discuss during a five-week informatics-related pharmacy student rotation. Leadership topics included health-system politics, organizational structure, perception, sources of power, conflict resolution preferences, and prioritization. One pharmacist informaticist led discussions with two student pharmacists and up to two additional pharmacist informaticists. When available, pre-assessments and surveys were provided to members of the initiative prior to the discussion in order to enrich the relevancy of the concepts. Student pharmacists were asked to share their perception of the value of the leadership information after each discussion, as well as at the end of the rotation.

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Results: Three pharmacist informaticists and two student pharmacists on informatics-related rotations participated in the five-week experience. Informatics learners gained leadership knowledge in health system politics and organizational structure after interdisciplinary committee meetings, perception and sources of power before and after pharmacy workgroup meetings, conflict resolution preferences after a drug shortage meeting, and prioritization prior to a large pharmacy conference. The student pharmacists indicated that they gained greater leadership insight than had been gained during prior rotations and were able to apply leadership ideals when working on projects and attending meetings during their rotation, resulting in a perception of a valuable experience. The pharmacist informaticists also indicated a deeper understanding for leadership concepts at the end of the rotation.

Conclusion: Integrating leadership education during informatics learning experiences resulted in increased leadership confidence for both informatics learners and pharmacist informaticists, and may improve the quality of projects and increase value of participation during meetings.

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Submission Category: Leadership Development

Poster Type: Descriptive Report

Session-Board Number: 49-M

Poster Title: Incorporating leadership development activities into pharmacy schools

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Purpose: Pharmacy curricula provide excellent scientific and clinical knowledge to enhance patient care activities. However, activities employed to develop leadership skills in the profession varies among schools of pharmacy. Leadership and professional development in any discipline is necessary for growth of that profession. Pharmacy employers report that it is challenging to recruit managers due to lack interest and training. Many student pharmacists lack exposure to leadership opportunities that foster new leaders for our profession. Leadership development should begin at the schools of pharmacy. This project seeks to identify methods that pharmacy schools use to educate students on leadership and professional development.

Methods: A literature search was conducted in Medline (1946 to March 2018) using the terms leadership, pharmacy education, and students. Of the 74 articles found, results were limited to 12 articles published in the last 10 years regarding leadership development strategies used in pharmacy schools nationally. Both curricular and co-curricular strategies were included.

Results: Several activities or programs that promote development of student leadership skills have been described. Such programs include, co-curricular educational series, longitudinal mentorship programs, missions trips, didactic elective courses, and elective practice experiences. Other, more traditional activities include student involvement in student government associations, student organizations, and community service related activities.

Conclusion: Many schools and colleges of pharmacy understand the value of offering students opportunities to develop their leadership skills. The expansion of these programs is necessary

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to bring forth a new generation of leadership to advance and promote our ever changing profession.

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Submission Category: Oncology/Hematology

Poster Type: Evaluative Study

Session-Board Number: 51-M

Poster Title: Rising cost of healthcare: Evaluation of the efficacy and safety of biosimilars versus biologics in chemotherapy patients

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Purpose: Biologics are often referred to as “miracle drugs” because of their ability to target critical areas of cancer cells. Due to their complex nature, being either derived from or containing products for living organisms, costs associated with production and manufacturing are higher than that of traditional therapies. Utilizing biosimilars which are similar in structure, clinical function, and immunogenicity when compared to biologics can, in theory, reduce cost and increase access to these medications. The purpose of this evaluative study was to compare the safety and efficacy of biosimilars compared to biologics in patients undergoing cancer treatment.

Methods: In the pursuit of general background information, investigators performed a search of tertiary resources, which included news and events updates from the National Cancer Institute. This followed a literature inquiry using the database “PubMed” for clinical trials or reviews relevant to biosimilars using MeSH terms such as “biologics”, “chemotherapy”, “efficacy”, “safety” and “cost-effectiveness”. Since biosimilars were first approved in the United States in 2015, articles reviewed were limited to years 2015 to present day. Studies were selected based upon the safety, efficacy and cost evaluations, as outlined in the articles.

Results: After an initial inquiry of “biosimilars”, a total of 163 clinical trials and reviews were identified. A total of 20 articles were included following the application of the previously stated MeSH terms with an acceptable publication date after the year 2015. Ultimately, it was discovered through a series of clinical trials such as the randomized clinical trial comparing the

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overall response rate of Trastuzumab and its proposed biosimilar, that biosimilars compared to biologics have an overall comparable efficacy and are indeed cost-effective directly reducing the cost of treatment. As stated, “In this randomized clinical trial that included 458 women, the overall response rate to the proposed biosimilar plus a taxane at 24 weeks was 69.6% (95% CI, 63.62%-75.51%) compared with 64.0% (95% CI, 57.81%-70.26%) for trastuzumab plus a taxane, which was within predefined equivalence boundaries.”

Conclusion: Although biologics provide a unique treatment to enhance the quality of life in cancer patients, it could impose a financial burden. As an alternative, biosimilars can broaden the access such therapy by reducing the cost of treatment. Compared to using biologics, studies show that biosimilars have comparable efficacy and are more cost effective for patients. However, in terms of safety and long term clinical outcomes, additional research is needed.

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Submission Category: Oncology/Hematology

Poster Type: Case Report

Session-Board Number: 52-M

Poster Title: Presence of T790M mutation in a treatment-naïve lung adenocarcinoma patient

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Purpose: Mutations in the epidermal growth factor receptor (EGFR) serve as a target for drug therapy in advanced non-small cell lung cancer (NSCLC). The most common sensitizing EGFR mutations initially seen in NSCLC patients include exon 19 deletions (19del) and a missense mutation on exon 21 (L858R). Patients harboring these driver mutations respond well to EGFR tyrosine kinase inhibitors (TKI), with improvements in survival observed in clinical trials compared to chemotherapy. Response, however, is short-lived with acquired resistance to TKI occurring in about 9 to 13 months. In the majority of cases, acquired resistance is due to a second mutation in exon 20 that results from a threonine-to-methionine substitution on codon 790 (T790M). This case involves a 72 year-old man with newly diagnosed, T790M positive, stage IV NSCLC. This diagnosis was made incidentally as the patient was being evaluated for symptoms of gastroesophageal reflux disease associated with weight loss and anemia. An abdominal CT scan ordered as part of the evaluation showed signs of metastatic disease in the lung and liver. A subsequent chest CT revealed multiple pulmonary masses with mediastinal, hilar, and supraclavicular adenopathy. Bilateral adrenal masses as well as a right thyroid mass were also noted. A follow-up PET/CT scan detected a lesion in the left frontal lobe of the brain. FDG-avid activity was also noted in the adrenals, bone, thyroid, liver, as well as multiple lymph nodes. Biopsy was positive for adenocarcinoma of pulmonary origin. Programmed death-ligand 1 assay revealed a tumor propensity score of 65%. Additional pathology showed a mutation in EGFR exon 21 L858R. Although the patient was naïve to EGFR TKI, a mutation in T790M was also noted. The decision was made to initiate osimertinib (Tagrisso) 80 mg by mouth once daily to target the EGFR driver mutations as well as to penetrate the central nervous system to treat

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the brain metastasis. In addition, whole brain radiation with corticosteroids were also administered. Although the patient initially responded to osimertinib, the disease ultimately progressed and the patient succumbed to the disease. T790M mutations have been observed rarely in patients newly diagnosed with NSCLC. De novo T790M mutations more frequently coexist with L858R mutations compared to 19del. The rate of detection of these mutations also improves with more sensitive tests. This is important to consider as the most effective treatment for this population is not yet known.

Methods:

Results:

Conclusion:

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Submission Category: Pediatrics

Poster Type: Descriptive Report

Session-Board Number: 53-M

Poster Title: Establishing a specialty pharmacy clinical workflow for a first in class medication

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Purpose: Cannabidiol oral solution (COS) was approved in June 2018 for treatment of seizures associated with Lennox-Gastaut syndrome and Dravet syndrome, two severe forms of epilepsy. Patients with these two disorders often continue to experience treatment resistant seizures despite traditional combination antiepileptic drug therapy. COS is a purified extract of Cannabis sativa, and is the first approved drug purified from a Cannabis plant and is currently on limited distribution status. Due these factors, COS is considered a specialty medication and is managed by specialty pharmacies and pharmacists.

Methods: Once a new medication is approved and designated as a specialty medication, it is imperative that specialty pharmacies develop and maintain a workflow to support patients and, in the case of COS, caregivers. We developed a robust clinical onboarding and routine assessment workflow to standardize specialty pharmacies ability to care for these patients. In addition, specific considerations for speaking with caregivers for pediatric patients must be considered. Outreach is often made to the patient's parents or guardian rather than the patient themselves. We hypothesized that frequent touch points with patients to improve adherence, provide a forum to answer questions, as well as monitor safety and efficacy. In our workflow, clinical pharmacists will counsel the patient and caregiver prior to starting the medication and again after 60-90 days. Utilizing the same endpoints as the landmark study of COS in pediatric patients, specialty pharmacy liaisons will assess seizure frequency as well as Patient and Caregiver Global Impression of Change Scale on a monthly basis. Based on the

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patient's response to therapy, either a clinical pharmacist or the patient's prescriber will follow up with the patient.

Results: Specialty pharmacy liaisons were educated on the specifics of COS and the metrics used to follow patients. To date, 45 patients have been enrolled into the clinical program for COS. Since implementation, our clinical pharmacists have performed 27 educational sessions with patients and 7 interventions with prescribing physicians.

Conclusion: First-in-class therapeutic agents represent a unique challenge to specialty pharmacies. Developing a valuable workflow around patient counseling, adherence and patient assessment is vital for patients to have optimal outcomes.

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Submission Category: Pediatrics

Poster Type: Case Report

Session-Board Number: 54-M

Poster Title: Preparation of propranolol cream for topical treatment of infantile hemangioma and its case series

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Purpose: Purpose:

Infantile hemangiomas (IHs) are the most common benign tumors of infancy. Propranolol is reportedly effective against IHs. Oral propranolol syrup is commercially available in Japan, Europe, and the United States. However, these solutions are reported to have systemic adverse reactions (ADRs), such as diarrhea, hypotension, and sleep disorders. Propranolol cream is expected to increase the cutaneous drug concentration, resulting in better involution of the hemangiomas, while also reducing systemic ADRs. In this study, we prepared propranolol cream and evaluated its pharmaceutical properties. Additionally, we present case studies of patients with IHs treated with the cream.

Methods:

We prepared 3 concentrations of propranolol cream (1, 3, and 5 percent) as a hospital formulation. Propranolol powder was suspended in 10 percent polyethylene glycol 400 solution. This suspension was then mixed with a hydrophilic cream (Mylan Inc., Osaka, Japan) to obtain 1, 3, and 5 percent propranolol creams. The creams underwent pharmaceutical evaluation; the propranolol content, pH, and extensibility of the creams were determined. In the stability study, the creams were stored at 25 degrees Celsius and 56 percent relative humidity for 3 months, following which the pharmaceutical properties were evaluated again.

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Furthermore, the propranolol creams were applied on pig skin, and the in vitro skin permeability was measured using Franz-type diffusion cells (effective diffusional area: 3.14 square cm, receptor volume: 17 ml). Topical treatment of IHs using propranolol creams was approved by the Institute Review Board of Iwata City Hospital (Shizuoka, Japan) and informed consent was obtained from the parents of all the patients. Three patients with IHs were treated with propranolol cream, applied twice daily in a thin layer onto the surface of the IHs. Size and color changes of the IHs were investigated from case records of patients.

Results:

The propranolol creams originally had a drug content of 99–103 percent, a pH of 3.6–3.9, and a ductility of 371–543 dyne/square cm. Despite storing for 3 months, the appearance (color and separation of cream) of the creams was intact, the drug content in 1, 3, and 5 percent propranolol creams was 102–105 percent, and all pharmaceutical properties (drug content, pH, and ductility) were not significantly altered. The in vitro permeability test found that, the cumulative amounts of propranolol through the skin were increased in a content-dependent manner of the cream. Three children with IHs presented to the outpatient clinic of Iwata City Hospital, and they were all treated with 1 and 3 percent propranolol creams. A 13-month-old girl had a superficial IHs on her upper lip, which involuted after 12 months of treatment. An 11-month-old girl had a superficial IHs on her left forearm; although treatment was temporarily stopped for 2 weeks because of redness on her affected part, the discoloration of her IHs was still noted after 8 months of treatment. A 3-month-old girl had multiple IHs over her ankle joint. The discoloration and reduction of size in her IHs were observed after 8 months of treatment.

Conclusion:

Our pharmaceutical evaluations indicated that propranolol creams can be prepared as a hospital formulation, have the appropriate quality and can be stored for up to 3 months in clinical settings. On application, propranolol creams can permeate transdermally and suppress the growth of hemangiomas. This case series shows that topical propranolol treatment appears to be effective, while reducing the incidence of systemic ADRs. It is, therefore, an alternative to oral propranolol for the treatment of IHs.

Methods:

Results:

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Conclusion:

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Submission Category: Professionalism and Career Development

Poster Type: Descriptive Report

Session-Board Number: 56-M

Poster Title: Is it feasible for hospital pharmacists to collect feedback from patients on their consultation skills?

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James Desborough

Purpose: The Interpersonal Skills Questionnaire (ISQ) was identified by previous studies to be a potentially appropriate tool for collecting patient feedback on pharmacists' consultation skills. A feasibility study was conducted to examine collecting patient feedback on consultation skills of hospital pharmacists. This abstract reports one part of this study which explored the potential for collecting this feedback using the ISQ, and also for providing pharmacists with individualized reports constructed from the collected feedback.

Methods: The study was conducted in secondary care in the East of England, United Kingdom, between July and October 2018. All pharmacists with patient facing roles were invited to participate, those interested were purposively sampled to obtain a 10 percent sample with maximum diversity. Pharmacists received an information session about the study including the ideal methods of questionnaire administration derived from literature. They were asked to attempt collecting feedback from at least 28 patients within one hour following a consultation, and to document the method(s) they employed. Recruitment stopped, when 28 completed ISQs were received per pharmacist, 40 copies of the ISQ distributed, 100 patients approached, or three months from starting, whichever came first. Patients aged 18 years and above who were deemed suitable to provide feedback by their pharmacists were considered eligible. Patients who agreed to participate were asked to complete the ISQ and return it in a sealed envelope to a marked box. At the end of the study, reports were sent to pharmacists summarizing their feedback results. Validated full reports were produced when at least 28 completed

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questionnaires were returned, whereas abbreviated reports were produced if a lower number was returned. The study received approval by the National Health Service (NHS) Health Research Authority.

Results: Six pharmacists were included in the study with median age (interquartile) of 27 years (25, 31), and three (50 percent) were females. One hundred and twenty five patients were approached to take part in the study, 119 agreed to participate of which 111 completed questionnaires were returned (response rate 93 percent). Fifty four percent (n= 60) of participants were females and 55 percent (n= 61) were over 60 years old. Most participants (68 percent, n= 75) were approached while being inpatients. Participants were reported to be mostly recruited directly by their pharmacists (72 percent, n= 80), however, one pharmacist only recruited patients by themselves, the remaining pharmacists used at least one other person in recruiting patients on more than one occasion (28 percent, n= 31). Three pharmacists collected feedback from at least 28 patients, the range of number of patients recruited per pharmacist was seven to 30. Validated or abbreviated reports were sent to each pharmacist.

Conclusion: This is the first study to investigate the feasibility of collecting patient feedback on hospital pharmacists' consultations. Quantitative study findings indicate that collecting feedback from patients is both feasible and acceptable, however, the process might not be feasible to all pharmacists as only 50 percent were able to collect feedback from at least 28 patients within the designated time period. Further qualitative work has been conducted to explore pharmacists' experience with the study. Limitations included small sample size of pharmacists and patients, and conducting the study in a single hospital.

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Submission Category: Professionalism and Career Development

Poster Type: Descriptive Report

Session-Board Number: 57-M

Poster Title: What patients think about giving feedback on hospital pharmacy consultations? a qualitative interviewing study

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James Desborough

Purpose: The Interpersonal Skills Questionnaire (ISQ) was identified by previous studies to be a potentially appropriate tool for collecting patient feedback on pharmacists' consultation skills. A feasibility study was conducted to examine collecting patient feedback on consultation skills of hospital pharmacists using the ISQ. This abstract reports one part of the feasibility study which explored the views of patients regarding their experience with giving feedback on hospital pharmacist consultations.

Methods: The study was carried out in secondary care in the East of England, United Kingdom, between July and October 2018. At the end of the pharmacist's consultation, patients aged 18 years and above who were deemed suitable to provide feedback by their pharmacists were approached to take part in the study. Patients were asked to complete the ISQ on the consultation they have just had with the pharmacist, those who agreed to participate were further invited to take part in a telephone interview conducted by a researcher to explore their experience with giving feedback. Interviews were conducted with participants as soon as possible following feedback collection (within a maximum of two weeks) at a time convenient to them. Topics discussed at the interview included participants' perceptions about the pharmacist's consultation, their experience with the feedback process, views about what could happen as a result of feedback, and views about future participation in giving feedback again.

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Interviews were transcribed verbatim and analyzed thematically. The study received approval by the National Health Service (NHS) Health Research Authority.

Results: Fifteen interviews were conducted with participants, eight (53 percent) were females and the median (interquartile) age was 67 years (55, 76). The mean interview time was 14 minutes with a range of 10 to 23 minutes. Five main themes emerged: opinions on pharmacists; views on feedback process; perspectives on the ISQ; benefits of feedback; and willingness and desire to continue give feedback in the future. All participants interviewed gave positive opinions about the pharmacist's consultation they assessed, highlighting the different skills used by the pharmacist during the consultation such as listening, using a clear language, putting them at ease and giving them enough time. The majority of participants didn't have any worries or concerns regarding the feedback process, some viewed it as well planned and smooth, however, a few participants thought certain aspects could be improved in the future, such as approaching patients more privately to seek their feedback. All participants gave positive reflections about the ISQ and its relevance to pharmacy consultations. With respect to feedback itself, participants mentioned different benefits that feedback could bring to patients themselves, to pharmacists, and to healthcare services. All participants expressed willingness to participate in providing feedback in the future.

Conclusion: This study provides qualitative evidence that collecting patient feedback on the consultation skills of hospital pharmacists is feasible. Findings indicate participants' positive experience with giving feedback and their willingness to continue to do so in the future. Participants viewed giving feedback of being beneficial to pharmacists and to patients themselves. Pharmacists could use this feedback in enhancing their consultation skills and in improving patients' health. Limitations included not conducting interviews immediately following the feedback collection process, thus participants' views might have been influenced by recall bias.

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Submission Category: Psychiatry/Neurology

Poster Type: Descriptive Report

Session-Board Number: 58-M

Poster Title: Evaluation of metabolic monitoring and diabetes incidence in Veterans newly started on an atypical antipsychotic

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Purpose: Atypical antipsychotics are widely used to treat psychiatric conditions and are known to cause increased risk of weight gain, metabolic syndrome, progression to type 2 diabetes mellitus (T2DM) and associated cardiovascular morbidity. The American Diabetes Association and American Psychiatric Association guidance recommends routine, weight, blood glucose, lipid, and blood pressure monitoring at specific intervals for patients newly initiating any antipsychotic. The purpose of this retrospective review is to investigate adherence to the ADA/APA guidance and determine rate of progression to diabetes in antipsychotic naive Veterans with no prior history of diabetes within the first year of atypical antipsychotics initiation.

Methods: The review was designated as a quality improvement project by the Institutional Review Board. Patient information between March 2009 and March 2019 was extracted from the Veterans Healthcare Administration corporate data warehouse. Patients were included if they received an atypical antipsychotic in Veterans Integrated Service Network 21, had no break in therapy greater than 30 days, were 18 years or older, had at least one outpatient appointment in six months prior to initiation, and continued one atypical antipsychotic for at least 1-year. Excluded patients were previously prescribed any antipsychotic, received more than one antipsychotic during the first year of treatment, or had any history of diabetes or A1C greater than 6.4 one year prior to antipsychotic initiation. Patients were flagged as progressed

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to diabetes if any A1C greater than 6.4 occurred or received an ICD10 diagnosis for T2DM during the first year of therapy. Patients were considered to have received baseline lab or weight monitoring if a value was documented within 3 months before and 1 month after atypical antipsychotic initiation. Patients were considered to have received appropriate follow-up lab monitoring if a value was documented within the month before or the month after the recommended follow-up timepoint. Weight was considered to have been appropriately monitored if documented within two weeks before and two weeks after each recommended follow-up monitoring timepoint.

Results: A total of 1922 antipsychotic-naïve patients who were treated with quetiapine (n = 951), risperidone (n = 461), aripiprazole (n = 293), olanzapine (n = 127), ziprasidone (n = 59), lurasidone (n = 26), or paliperidone (n = 5) were included in the final cohort. In the final cohort, 222 patients (11.6%) were identified as having progressed to T2DM during the first year of treatment. Of 1922 patients, 631 (33%) received all recommended blood pressure monitoring, 154 (8%) received all recommended blood glucose monitoring, 42 (2%) received all recommended lipid panel monitoring, and no patients received all recommended weight monitoring.

Conclusion: In an antipsychotic-naïve and non-diabetic Veteran population initiating an atypical antipsychotic, we found no patients received all recommended metabolic monitoring. This may be due to a lack of clinical decision support tools, clinical reminders, or metrics associated with metabolic monitoring for patients newly initiating an antipsychotic. Furthermore, 11.6% of this population progressed to T2DM within the first year of atypical antipsychotic initiation. A case-control design will be utilized to determine differences in T2DM progression. Ideally, all patients should receive guideline recommended monitoring. Implementation of new tools in the electronic medical record may assist providers in ensuring appropriate monitoring occurs.

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Submission Category: Psychiatry/Neurology

Poster Type: Evaluative Study

Session-Board Number: 59-M

Poster Title: Characteristics of the Veterans Health Administration population diagnosed with major depressive disorder and suicidal ideation or suicide attempt

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Purpose: In the United States, major depressive disorder (MDD) is currently the second leading cause of severe disability and mortality and has been associated with ~50% of all completed suicides. The suicide rate is nearly 19% higher among male veterans than the general population; thus, understanding the clinical features and treatment patterns of those receiving care in the Veterans Health Administration (VHA) is an imperative.

Methods: Adult patients diagnosed with both MDD and either suicidal ideation (SI) or suicidal attempt (SA) between January 1, 2014 and March 31, 2018 were selected from the VHA database. The date of the first claim for SI or SA was defined as the index date. Patients were required to have continuous enrollment for ≥ 12 months pre-index date and were followed until the earliest of death, disenrollment, or 12 months (post-period). Patients were excluded if they had a diagnosis of psychosis, schizophrenia, bipolar disorder, mania, or dementia. Co-occurring conditions (based on Elixhauser index and DSM-5 classifications) were evaluated 12 months prior to the index date (pre-period). Treatment patterns, including antidepressant (AD) and other psychiatric medication use, were evaluated in the 12-month pre- and post-periods. Descriptive statistics, including means for continuous variables and percentages for categorical variables, were provided for all study variables.

Results: In the final sample, (N=43,156) the mean age was 51 years, and most patients were male (87.9%) and white (66.8%). Almost all patients had a diagnosis of SI on the index date

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(90.7%). In the pre-period, the most common (>20%) conditions from the Elixhauser index were hypertension (58.9%), alcohol abuse (28.6%), and drug abuse (23.2%); conditions from the DSM-5 included “other conditions that may be a focus of clinical attention” such as abuse and neglect (68.8%), trauma and stressor related disorders (40.2%), anxiety disorders (30.7%), and sleep-wake disorders (24.7%). Most patients had evidence of ≥ 1 AD in the pre-period (67.9%), which increased in the post-period (87.7%). The proportion of patients with non-AD medication use also increased (37.2% to 53.6%); specifically, use of anticonvulsants from 29.4% to 40.5% and use of antipsychotics from 11.9% to 23.7% during the pre-period and post-period, respectively. Similarly, the number of unique ADs and the number of unique non-AD medications increased from 1.24, 0.47 in the pre-period to 1.82, 0.77 in the post-period, respectively. Also, most patients had evidence of cognitive behavioral therapy which increased from 57.8% in the pre-period to 81.1% in the post-period.

Conclusion: These data document a high burden associated with co-occurring conditions for those with diagnosed MDD and SI or SA. Although psychiatric treatment was common prior to the diagnosis of SI or SA, utilization of both psychiatric medications and psychotherapy was markedly increased in the post-period. Taken together, these results highlight the complexity of care and continuing need for active screening, early intervention, and efficacious treatments to reduce the burden of suicide in the VHA population.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 60-M

Poster Title: Raising the bar with a well-established medication safety program

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Purpose: Medication errors are as a concern today as they were in 1999. To prevent medication errors, we must modify how we view them and learn from our past mistakes. Understanding how to overcome error reporting obstacles is important as reported incidents measures the culture in any organization.

This project presents how a tertiary care hospital (380 beds) has improved patient safety and raised the bar toward Zero harm from medications through a well-established medication safety program that improved reporting medication incidents to determine and reduce the major causes of medication error and implementing safety strategies and best practices.

Methods: We developed and implemented a collaborative and comprehensive medication safety program. The focus was on Staff Education, Organizational Culture and Reporting System Enhancements.

Staff Education was done about strategies for preventing medication errors, the process of medication error reporting and investigating errors from a system perspective versus an individual practitioner prospective, what incidents should be reported, the definition of a medication error, versus a near miss, the importance of reporting and how to report. Reporting system enhancement was done based on the feedback of the staff to simplify the process of reporting errors and reduce reporter burden to increase reporter compliance.

Just Culture was piloted by Medication Safety Officer in Pharmacy with the support of the Pharmacy director then has been introduced to nursing and now has been a hospital wide objective.

The good catch program started in Pharmacy and nursing 2015 to recognize the reporter that has been then enhanced to a great catch program from higher management as a hospital wide

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program 2017. This has not only improved medication incidents reporting, but also markedly improved the frequency and quality of reported incidents.

Medication Safety Officer with a hospital multidisciplinary committee worked in recognizing, designing and implementing best medication safety strategies to reduce medication errors. The focus was on systematic approach to decrease organizational susceptibility to errors by monitoring, analyzing and implementing effective interventions.

Results: Staff started to feel more confident about reporting medication errors and contributing to efforts to advance patient safety.

In 2018 reached 1100 reported medication incidents compared to 643 reported medication incidents in 2016 with 71.1% increase and a shift toward more nearmiss reported and decreased in temporary harm

99.55% of all reported medication incidents in 2018 were Near misses (75.9 %) and no harm (23.81 %) followed by 0.44 % with Temporary harm compared to 2016 97.4% of all reported medication incidents were Near misses (56.1%) and no harm (41.3%) followed by 2.6 % with Temporary harm.

Medication errors are almost never caused by the failure of a single element in the system.

More often, multiple underlying system failures lead to the error, many of which can be identified by analyzing these errors. Root cause analysis for 82 incidents were completed in 2018 compared to 55 in 2016 with a lot of strong actions and recommendations implemented and safety alerts were sent as a lesson learned from reported incidents.

Three different ISMP Self assessments were conducted to identify the gaps and working on action plan.

Awareness campaign were done to improve patient engagement toward enhancing patient safety

Conclusion: A medication safety program should not be segregated from a hospital's overall patient safety and quality program. The success of a collaborative and comprehensive medication safety program is dependent on a hospital-wide culture of patient safety, including a safety infrastructure, led by an empowered medication safety officer from supportive pharmacy director and a multidisciplinary team as medication safety is a team sport. Developing a strategic medication safety plan is essential to ensure patients receive the safest and most effective care in healthcare.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 61-M

Poster Title: It takes a village: utilizing a regional patient safety coalition to meet ISMP targeted medication safety best practice 14

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Purpose: Sharing lessons learned from errors or medication safety dilemmas experienced by other local organizations is an effective mechanism to prevent harm within a healthcare facility and to standardize best practices. This approach has been value-added for the Indianapolis-based regional patient safety coalition as physicians, nurses, and healthcare trainees are often shared between the organizations.

Methods: The Indianapolis Coalition for Patient Safety (ICPS) provides a forum for Indianapolis-area hospitals to share information about best practices and collaborate to solve patient safety issues. A free-standing non-profit, ICPS is comprised of chief executive, medical, nursing, quality/safety and pharmacy leaders as well as front line staff from the six major Indianapolis health-systems. In addition, ICPS works closely with many community partners: departments of health, professional organizations, and institutions of higher learning, to name a few. While competitors in the market-place, hospital leaders have come together and agreed to not compete on safety. ICPS members have a shared vision and challenge of making Indianapolis the safest city for healthcare. Over the last year, the ICPS Medication Safety work-group began sharing medication safety events and close calls monthly on a rotating basis at each site as well as collaborating on ad hoc issues that arise between meetings. A peer review protected forum, sharing takes the form of formal presentations, reviewing order sets, electronic health record

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(EHR) components, policies, or protocols, discussing root cause analysis (RCA) findings, or other mechanisms, as appropriate. This project describes the medication safety issues within the ICPS network that have resulted in enhanced healthcare delivery.

Results: In 2018, 25 unique medication safety dilemmas were addressed during 12 standing meetings. The following results represent significant examples of collaboration within the coalition hospitals. For example, Facility A noted potentially serious issues with the accuracy and precision of INR results from point of care (POC) devices. Though collaboration, it was noticed these results were not isolated to just Facility A. Data was shared with the remaining organizations and POC testing ceased. The FDA was notified, ultimately resulting in a recall of the test strips. Led by Facility B disaster preparedness team, a city-wide ad hoc team was formed to address the critical drug shortages of intravenous (IV) fluids, in partnership with a local, private emergency management organization. The team developed Consensus Standards for IV push medications and targeted IV to oral medication conversion. Facility C noticed a trend in adverse drug reactions with IV iron and requested information from the coalition and additional sites confirmed similar incidents, highlighting the larger, more widespread issue at hand. Facility D experienced a temperature variation in a refrigerator used to store immunizations. Through this issue a subsequent barrier analysis was conducted, and all gaps have been shared with the coalition work-group.

Conclusion: This collaboration through ICPS has achieved accelerated outcomes by sharing resources, performance targets, accountability, and lessons learned. ICPS members have undertaken projects focusing on patient-centered strategies to improve safety. Using subject matter experts from Coalition hospitals has allowed the workgroup to identify hidden risk points and errors that could easily be repeated at other sites if left unaddressed. Sharing our best practices and promoting standardization across the city should help to prevent similar errors in the future, thus decreasing patient harm.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 62-M

Poster Title: Development and implementation of a data tool for monitoring automated dispensing station (ADS) overrides at a large academic medical center

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Purpose: Medication orders evaluated by pharmacists leading to profiled automated dispensing station (ADS) vends are best practice components of the medication use process. Monitoring ADS overrides is a defined compliance and safety expectation to evaluate appropriateness of override indication, urgency and frequency. Our project was to develop a data tool to allow system leaders the ability to monitor and trend ADS overrides. There was desire to be able trend per hospital, unit, and medication and to be able to drilldown on system defined high alert medications. Additionally, there was goal to visualize whether medication orders were entered and linked post override.

Methods: A tableau dashboard was created to offer ADS override data to quality, nursing, provider and pharmacy leaders within an academic medical center, including three hospitals: adult, children's and psychiatric and many outpatient clinics. The system had a previous tool that used ADS override data through a monthly query and desired to convert the data source to EPIC clarity, so data could be updated daily. Data views were developed to mirror current data tool views for BCMA compliance that leaders were familiar with. Development included drilldown options per hospital, unit, and medication. Further development of views occurred via focus groups with engaged topic stakeholders. The medication safety officer partnered with the enterprise nurse quality committee to define several discovery units where initial rapid

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PDSA cycles occurred. Best practices among discovery units were shared within the enterprise nurse quality committee and medication safety committees. The new data was launched in conjunction with existing BCMA compliance data to leaders already engaged in BCMA work. A speaking tour to educate on new ADS override data available was completed by the medication safety officer to many nurse and quality centric groups. Further data tool maintenance and optimization continues to occur.

Results: High alert medication override volume decreased by 54%, and high alert medication override percentage decreased by 51% from November 11, 2018 to February 17, 2019. All medication override volume decreased by 33%, and all medication override percentage decreased by 32% during this time.

Conclusion: The development and implementation of an ADS override data tool was a multidisciplinary effort to offer actionable data to evaluate, identify opportunities for improvement and strengthen practices surrounding ADS accesses. The medical center was able to tighten ADS override rates with the use of this tool.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 63-M

Poster Title: Risk evaluation and mitigation strategies (REMS) medication compliance review in an academic health system

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Purpose: As of November 2018, 75 medications required Risk Evaluation and Mitigation Strategies (REMS) components for use of these medication in the United States. Due to the large number of REMS medications on the market and the complexity of knowing each individual REMS medication strategy, health systems struggle to implement and keep up with REMS medication requirements. The purpose of this study is to review the compliance and associated documentation of selected REMS medications used within one health system.

Methods: A single-site, retrospective chart review audit was completed for the study period of January 1, 2017 – December 21, 2017. Ten REMS medications used by the health system were selected for review. These medications included were: alvimopan, bosentan, clozapine, collagenase clostridium histolyticum, denosumab, eculizumab, natalizumab, naltrexone, romiplostim, and testosterone undecanoate. Primary outcome was the percentage of compliance with the REMS medication components (n=51) for each of the selected REMS medications. Secondary outcomes included the number of each selected REMS medication, appropriate Food and Drug Administration (FDA) indication, and appropriate dose.

Results: Three hundred twenty-nine patients received one of the selected REMS medication during the study period accounting for 2,494 doses total doses administered. A sample of ninety-two patients receiving nine hundred seventeen doses was selected for review. Of the fifty-one REMS components, 15 components were 100% compliant, 11 components had various levels of compliance, 9 components were 0% compliant, 8 components were unable to assess, and 8 components were not applicable. Ninety patients (98%) were prescribed the REMS

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medication for the appropriate FDA indication and nine hundred and eight doses (99%) were appropriately administered.

Conclusion: Many REMS medication compliance strategies are available to consider. Some strategies include: policy development, formulary consideration, leveraging the electronic medical record, REMS medication metrics / routine audit process, and education to health care professional regarding REMS medication programs.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 64-M

Poster Title: Aligning the interpretation of therapeutic duplication between clinicians and regulatory requirements

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Purpose: Therapeutic duplication is the prescribing of multiple medications for one indication where there is no clear distinction of when to give one medication instead of the other. The Joint Commission Medication Management chapter 4.01.01 states that orders must be clear and accurate. This standard is consistently reported to be in the top ten cited standards on Joint Commission surveys due to therapeutic duplication. This can lead to variable interpretation of orders and adverse events. We set out to assess our own compliance to the Joint Commission standards after transition to a new computerized order entry system with order set implementation.

Methods: Patients included in this study were located on a surgical unit and a general medicine floor. Medical records of 50 randomly selected patients were reviewed. Medical records were audited for therapeutic duplication, analyzing as needed orders for pain, nausea/vomiting, and constipation. Medication administrations were captured for complete evaluation. Nurses were interviewed about their practice and interpretation of orders.

Results: The number of duplicate orders for pain and nausea/vomiting was 45/124 (36 percent) and 32/50 (64 percent), respectively. The percentage of exact duplicate orders was eight percent. The order sets utilized were assessed for appropriateness and contained instruction on when and how to administer each medication. This was true for many order sets, however not all. The implementation of linked orders, pain scales, and identified sequence of orders aided in

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ensuring clear interpretation. A major problem identified was medication reconciliation. Providers were not thoroughly reviewing current active medication orders and patients had overlapping order sets containing similar as needed orders for pain and nausea/vomiting. As needed orders for constipation were not an issue because new order sets guide providers towards scheduled frequencies. Nursing interviews revealed that there are discrepancies in order interpretation from nurse to nurse. These interviews shed light on potential policy infringement, as some nurses have developed their own robust algorithms to give as needed medications, while others have not.

Conclusion: Therapeutic duplication continues to be a challenge at our institution. Order set implementation was the first step in standardizing interpretation of as needed orders. Barriers identified include medication reconciliation and further clarification of policies on standardizing multimodal approach for nursing and other providers. We are addressing these identified barriers with our Joint Commission preparedness groups.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 65-M

Poster Title: Real-time review of positive blood cultures in hospitalized patients: Leveraging the electronic medical record as an antimicrobial stewardship tool

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Purpose: Untreated and undertreated bloodstream infections can increase risk of morbidity and mortality, infectious sequelae, healthcare costs, and contribute to antimicrobial resistance. We identified a means for real-time monitoring of all positive blood cultures for admitted patients to our institution with the aim to optimize care and minimize complications of bacteremia. This project was designed to augment our current electronic medical record (EMR) without incurring costs of a third-party surveillance software. The purpose of this initiative was to identify patients with bacteremia in real-time and assess the impact of daily review by the Antimicrobial Stewardship Program (ASP) team.

Methods: The ASP team, in conjunction with hospital informatics and the microbiology laboratory, created a workflow to route real-time alerts of all positive blood cultures for admitted patients to a shared ASP in-basket in the EMR. In-basket alerts were automatically updated with any changes or additions to microbiology or susceptibility reports. This process was initiated in the Fall of 2017 and implemented in February 2018. A member of the ASP team reviewed all positive blood cultures on weekdays until finalized to 1) assess if the blood culture represented a true bacteremia or contamination, 2) ensure the patient was receiving the optimal antimicrobial at the best dose and duration, and 3) recommend consideration for further testing or Infectious Diseases consultation. All recommendations were discussed with the primary provider, Infectious Diseases team (if consulted), and the unit-specific clinical

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pharmacist. ASP team members maintained daily documentation of the clinical assessment and any interventions made. Clinical interventions were classified as either 'major' or 'optimization.' Major interventions included therapy escalation, bug-drug mismatch, recommending an Infectious Diseases consult or further work-up, initiation of treatment (including for discharged patients) and implementing cost-effective therapy. Optimization interventions included dosing or pharmacodynamic enhancements, therapy de-escalation or consolidation, intravenous to oral conversion, or discontinuation of therapy. All interventions were queried monthly to assess the impact of the new service.

Results: Between February 2018 and February 2019, 1,767 patients with positive blood cultures were reviewed by the ASP team. Of those, 240 (13.6%) patients required an intervention by the ASP team, 81 of which (4.6%) were considered major interventions. Major interventions consisted of initiating antimicrobials in patients not on active treatment, notifying primary care providers of culture positivity if the patient had been discharged from the hospital, or escalating therapy based on culture and susceptibility data. The remaining 159 (9%) interventions consisted of treatment or dosing optimization, de-escalation based on culture results, and discontinuation of therapy in the setting of likely contamination.

Conclusion: Leveraging our EMR as an antimicrobial stewardship tool without reliance on third-party stewardship surveillance tools was a cost-effective strategy to optimize patient care for admitted patients with bacteremia. Additionally, this process provides opportunity for other healthcare systems without access to third-party surveillance tools to broaden antimicrobial stewardship efforts and facilitate appropriate and judicious use of antimicrobial agents while improving patient care. Finally, the real-time nature of this tool represents a major advantage for ASP teams to optimize workflow, communicate with covering providers in a timely manner, and potentially reduce time to optimal antimicrobial therapy including transition to effective outpatient treatments.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 66-M

Poster Title: Characterization of orders abandoned during the computer-physician order entry process before completion and signature

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Purpose: A variety of medication prescribing errors occur frequently during medical care. Measurement of self-intercepted errors prior to signature has been performed rarely, only in the setting of alerts. To investigate pre-completion self-intercepted errors, measurement of order abandonment (i.e., orders started but not signed) is an important starting point. In addition to error interception, abandonment may be due to excess cognitive load, interruptions, computer user interface problems and other workflow related issues. To date, order abandonment has not been well measured. This study will measure order abandonment and describe some characteristics associated with abandonment to begin to understand this understudied phenomenon.

Methods: An order start tool was created in CERNER Millennium electronic health record (EHR) at an academic medical center in February 2017 to capture abandoned orders (i.e., medication orders that are started but not signed). The tool was developed to record medication starting data to a table every time a medication order was started. The tool was operational in all venues: inpatient, ambulatory and emergency department. The data in the table can be retrieved using an "order start report" which reports the patient encounter number, medication, time/date, ordering clinician, medical service and patient location. Medications appearing on the "order start report" without a final order, based on comparison with a signed orders report, are considered abandoned. Pre-built intravenous drip solution orders, orders

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initiated or renewed from a medication reconciliation interface, and orders placed in an order set, except the initial order, were not recorded in the “order start report” for technical reasons. The loss of all but the initial medication order from order sets represents an approximate 5% loss of started orders. A logistic regression analysis was performed on all medication starts between October 1st 2018 to December 31st 2018 to identify factors associated with order abandonment. A p-value of 0.05 was considered to be statistically significant. Statistical analysis was performed with “R” version 3.5.2.

Results: There were a total of 706,587 orders on the order start report during our study time period, of which 692,865 orders were signed and 13,722 orders were abandoned prior to signature, resulting in a 1.94% abandonment rate. Abandoned orders were significantly more likely to occur during the day, followed by night then overnight (2.10% , 1.65% and 1.39%, respectively; $p=0.011$). The ambulatory care setting had the highest abandonment compared to inpatient, with the emergency department lowest (2.70%, 1.58%, and 1.22%, respectively; $p<0.001$). The rate based on ordering clinician type varied slightly with pharmacists being the lowest and attending physicians the highest (1.84% and 2.07%, respectively; $p=0.001$). Variation based on route of administration was present, with topical, otic, nasal, ophthalmic medications abandoned 2.69% of the time, but oral medications only 1.91% ($p<0.001$). The variation by age was biphasic, highest in ages 0 to 2 years (3.25%) or greater than 64 (2.31%) and lowest in ages 18 to 45 ($p<0.001$, when comparing age extremes to ages 18 to 45). There were relatively small differences based on patient sex (men 1.83% and women 2.02%; $p<0.001$) and race, with white patients the highest and black patients the lowest (2.02% and 1.89%, respectively; $p=0.003$).

Conclusion: Abandonment occurred in 1.94% of medication orders. This appears significant, but there are no published comparators. Abandonment was associated with many factors. The increase in abandonment in the very young and old as well as during the day may suggest an effect of clinician cognitive load from these relatively sicker patients and busier times. Because this is the first study to characterize abandonment, further analysis is warranted. Variations in abandonment throughout the academic year, between institutions, by clinician gender and experience, clinician workload, and workflow interruptions should be accounted for in future analyses.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 67-M

Poster Title: Before and after evaluation of an intervention regarding first dose neonatal intensive care unit antibiotic workflow in the sterile products room

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Purpose: In order to provide timely and high-quality patient care, operations in the sterile products room must be optimized. The pharmacy department identified multiple barriers in the sterile products room (SPR) workflow that prevented first-dose neonatal antibiotics from arriving to the patient within a 1 hour. The purpose of this study was to improve SPR workflow surrounding neonatal intensive care unit (NICU) first-dose antibiotics to meet the expected 1 hour turn-around time from order verification to delivery.

Methods: The study was designed as pre/post intervention and evaluated all NICU orders for first-dose gentamicin, ampicillin, and nafcillin in April 2018 (pre-intervention) and June 2018 (post-intervention). These agents were selected for their varying degrees of manipulation; gentamicin does not require dilution, ampicillin requires a single dilution, and nafcillin requires a double dilution. In May 2018, the intervention was implemented and consisted of twice daily education to the SPR staff, a pharmacy department email, and a pharmacist-targeted presentation. Education was centered around improved communication, pearls for technicians compounded the product, and the verification process for pharmacists. The outcomes of this study included percent of orders that were verified and sent to the patient within 1 hour and the change in time required to perform each step in the SPR workflow. The steps were defined as: order verification to SPR preparation, SPR preparation to 1st pharmacist check, 1st to 2nd pharmacist check, 2nd pharmacist check to unit delivery, and unit delivery to administration.

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Results: The number of orders identified pre/post intervention included 65/48 for ampicillin, 58/50 for gentamicin, and 3/5 for nafcillin. There was a statistically significant increase in number of orders that were sent within 1 hour of verification during the evening shift for gentamicin between the pre and post intervention ($n=8$ and $n=19$, $p=0.048$). The change in the number of orders that were sent within 1 hour of verification was not significant for gentamicin during the morning or overnight shifts or for ampicillin and nafcillin during any shift. We found the mean and median change in time to complete SPR workflow steps to be constant or decreased with respect to the pre-intervention baseline. There was a statistically significant decrease in time from SPR preparation to 1st pharmacist check for ampicillin (32.5 min vs 24 min, $p=0.005$) and gentamicin (27 min vs 21 min, $p=0.03$), for 2nd pharmacist check to unit delivery for ampicillin (2 min vs 1 min, $p<0.001$), and for unit delivery to administration ($p=0.007$).

Conclusion: An education-based intervention targeting SPR staff and all pharmacists increased SPR workflow efficiency and improved time to administration of first-dose sterile compounded NICU antibiotics.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 68-M

Poster Title: Predicting sound-alike look-alike medication pairs with a prediction model

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Purpose: Sound-alike-look-alike (SALA) medication errors are the inadvertent prescribing, dispensing, or administration of the wrong medication attributed to the intended medication having a similar name, look, or packaging. Although, the FDA employs a comprehensive program to prevent SALA confusion prior to market approval, such medications continue to enter the market, e.g., Brintellix (vortioxetine) and Brilinta (ticagrelor). SALA medication errors may be reduced if medications at high risk for SALA confusion are effectively identified prior to marketing. Thus, the purpose of this study was to use a case-control study design to develop and validate a data-driven prediction model for SALA medication pairs.

Methods: We used the medications pairs on the ISMP List of Confused Drug Names as SALA medication case pairs and randomly selected control medication pairs from the First DataBank's MedKnowledge (FDBM) database. We randomly divided the ISMP List and FDBM Database into 75%/25% training and validation sets. We performed a matching medication-product attribute and a string-similarity analysis for each medication pair to create seven matching medication-product attribute and 82 medication-name similarity measures as candidate predictors. We used a modified bootstrap method, involving three steps, to develop and validate a prediction model. First, we performed 20,000 stepwise-AIC logistic regression analyses with the candidate predictors to ascertain parsimonious models, each time with a different set of randomly selected case and control medication pairs from the training set. Candidate predictors that appeared in >60% of the parsimonious models were retained as predictors. Second, we performed 20,000 logistic regression analyses with the selected predictors to estimate each predictor's coefficient value, each time with a randomly selected training set. We computed the mean coefficient value of each predictor as the coefficient value in the final prediction model.

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Third, we performed 20,000 validation studies with the final prediction model and computed model performance measures, each time with a randomly selected validation set. The mean of each performance measure was used to evaluate model performance. All analyses were completed in R 3.4.1.

Results: We identified 13 predictors of SALA medication pairs, four measures of matching medication-product attribute (same manufacturer, medication class, package unit, and strength) and nine measures of medication name similarity (Tri-gram-2b, Soundex edit-distance, Jacard, same first letter, character difference, same number of characters, ratio of shared pre-fixed, and optimal string alignment distance). The predictor matching on the same manufacturer appeared in all parsimonious prediction model and optimal string alignment distance was the most significant predictor of SALA medication pairs (12.66, 95% CI 10.05 to 15.54). The final prediction model had a mean c-statistic of 0.987, sensitivity of 0.870, specificity of 0.986, positive-predictive value of 0.939, and negative-predictive value of 0.968.

Conclusion: We were able to develop and validate a data-driven, prediction model that accurately predict SALA medication pairs based on matching medication-product attribute and medication name similarity measures. This model could be used to proactively identify SALA medication pairs and potentially prevent SALA medication errors.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 69-M

Poster Title: Utilizing a multidisciplinary approach to optimize efficiencies of the medication distribution track and deliver process

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Purpose: Pharmacy technicians at a 1,500 bed academic medical center utilize hand held devices to track the dispense, transfer and delivery of patient specific medications to their appropriate locations on patient care units. Alongside pharmacy, nursing and respiratory therapy staff use the computerized prescriber order entry (CPOE) system to track and identify the location of medications. The purpose of this pilot project is to identify and address barriers to the track and deliver process in order to optimize medication distribution, thereby enhancing patient experience.

Methods: To improve patient experience and medication distribution via track and deliver, pharmacy collaborated with nursing, respiratory therapy, a consulting group and a pharmacy technology vendor. The pilot project involved multidisciplinary staff on three patient care units across two campuses at a large academic medical center. Identified pilot units were based on those with highest number of unsuccessful medication transfers. The scope of this project further focused on patient specific inhalers given that inhalers were identified as a high cost medication and also have finite usage.

Outcome measures were collected on the number of orders, redispenses, unsuccessful versus successful transfers and scanning compliance of patient specific inhalers in order to assess effectiveness of the medication distribution track and deliver process. Additionally, all pilot unit members participated in a survey and day in the life experience in order to gain insight into

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each healthcare discipline's role in relation to the medication distribution track and deliver process.

Results: Outcome measures showed a 27 percent redispense rate of inhalers, a 77 percent rate of successful transfers, a 23 percent rate of unsuccessful transfers and a 33 percent rate of scanning compliance across the three pilot units. Survey results demonstrated an 87 percent agreement in the need to reduce the number of redispenses among healthcare disciplines. At least 80 percent of pilot members strongly agreed that medication availability in the proper location is a critical component to a successful track and deliver process. Survey results further showed that at least 30 percent of nursing and respiratory therapists have a strong understanding in utilizing the CPOE to track the transfer and delivery of patient specific medications. There was at least a 40 percent agreement that pharmacy, nursing and respiratory therapy communicate effectively among each healthcare discipline. Feedback from the Day-in-the-Life experience similarly identified a lapse in communication and understanding of each healthcare disciplines role in the medication distribution transfer process.

Conclusion: Communication and knowledge barriers among pharmacy, nursing and respiratory therapy were identified on the medication distribution track and deliver process. Education and training modules were developed to address proper communication channels and medication distribution track and deliver process gaps. A multidisciplinary team approach allowed successful optimization of the medication distribution track and deliver process.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 70-M

Poster Title: Standardization to consistent dose units in the electronic health record across transitions of care

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Purpose: To prevent medication errors by standardizing to consistent dose units in the electronic health record throughout the medication use process from pre-admission to discharge in accordance with safety organization recommendations. Based on safety events, we targeted medications that may be expressed in micrograms (mcg) and milligrams (mg) as well medications expressed per dose versus total daily dose (e.g. mg/kg/day).

Methods: Several safety events were reviewed amongst adult and pediatric patients in which conversion or ordering errors occurred due to inconsistent dose-units in pre-admission medication lists, admission, or discharge ordering. Medication safety and pharmacy information system team generated a report to identify medications ordered in mcg and mg and developed criteria for standardization and error-prevention opportunities. The dose-units in each ordering setting was compared to the product dose-units, age context (neonate, infant, pediatric, & adult), & drug references, with consideration of dosage form and transitions of care implications. Dose-unit standardization was recommended when there was little or no potential for unintended consequences. Clinical content experts were contacted to gain consensus when a medication (e.g. digoxin) was listed inconsistently in drug references.

Results: From 26 medications identified during the assessment, 14 improvement opportunities were developed from a review of adult, pediatric, and neonatal ordering contexts. Five

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medications had mg/kg/day removed from ordering, eight medications were standardized to one dose unit to match drug references and product units, and two medications were not modified. With select medications, multiple dose-units were necessary due to dosing needs in neonates versus older pediatric or adult patients. In addition to tablet dose-unit standardization within the ordering module, other error prevention strategies were employed: the addition of common dose buttons for ½ strength tablets to avoid the need to manually enter the dose, and mg-mcg conversion charts of common doses were provided in ordering instructions.

Conclusion: Consistent dose-units in ordering modules are a valuable safety strategy to avoid factor of ten medication errors or incorrect dose/total daily dose errors during transitions of patient care.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 71-M

Poster Title: Impact of intravenous drug shortages on prescribing patterns and practice in a comprehensive cancer center

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Purpose: The American Society of Health-System Pharmacists (ASHP) defines a drug shortage as “a supply issue that affects how the pharmacy prepares or dispenses a drug product or influences patient care when prescribers must use an alternative agent.” At Memorial Sloan Kettering Cancer Center (MSK) intravenous opioid and electrolyte shortages have had a large impact. MSK has devoted significant resources to reduce the harmful effects of drug shortages on our patients. This project was designed to compare prescribing practices prior to and after significant drug shortages; and to identify opportunities to enhance practice at MSK.

Methods: We retrieved usage reports for intravenous electrolytes, oral electrolytes, intravenous opioids, intravenous ketorolac, intravenous acetaminophen and oral opioids from the well-established institutional data collection systems from January 2017 through January 2019. Usage of each medication class was collected prior to the shortage, during the shortage and after the shortage had resolved. Next, we completed a review of intravenous electrolyte orders placed after Pharmacy and Therapeutics committee approved restrictions had been implemented to assess compliance with the restrictions and appropriateness of intravenous electrolyte orders. Lastly, we completed a gap analysis between ASHP’s Guidelines on Managing Drug Product Shortages and MSK’s policies and procedures and to specifically update MSK’s Medication Shortages Policy.

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Results: Usage of intravenous electrolytes decreased from before the shortages to after the shortages resolved. Over the past year, intravenous magnesium usage decreased 64% and oral magnesium usage increased 8.8% (n=16,091 orders). A chart review of 47 patients receiving intravenous magnesium found that 74% of patients receiving intravenous magnesium met the restriction criteria for intravenous administration. From January 2017 to January 2019, intravenous potassium chloride usage decreased 59.5% and oral potassium chloride increased 74.2% (n=11,769 orders). A chart review of 118 patients found that 28.5% of patients receiving intravenous potassium chloride met the restriction criteria. At the peak of the intravenous hydromorphone shortage in March 2018, the number of doses dispensed compared to January 2018 were as follows: intravenous hydromorphone decreased 53.6%, intravenous morphine increased 40.8% and intravenous fentanyl decreased 0.2%. Recommended alternatives such as intravenous acetaminophen decreased 1.4%, intravenous ketorolac decreased 13.8% and all oral opioids increased 9.2%. From January 2018 to January 2019, number of doses dispensed changed as follows: intravenous hydromorphone decreased 30.8%, intravenous morphine increased 20.9%, intravenous fentanyl increased 10%. The number of doses dispensed of alternative medications increased as follows: intravenous acetaminophen increased 80.5%, intravenous ketorolac increased 15.8% and all oral opioids increased 16%.

Conclusion: Many of the intravenous electrolyte and opioid shortages have resolved, however, prescribing practices at MSK have shifted towards more conscious prescribing of intravenous medications in favor of oral alternatives. The shift in intravenous electrolyte prescribing practices is likely the result of restrictions from MSK's Pharmacy and Therapeutics committee approved guidelines endorsing oral medications and increased awareness of drug shortages. The decrease in intravenous hydromorphone usage is likely due to more cognizant prescribing practices following the severe shortage and could be from the significant increase in intravenous acetaminophen use. Additionally, MSK's drug shortage policy was enhanced in accordance with ASHP's recommendations.

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Submission Category: Transplant/Immunology

Poster Type: Descriptive Report

Session-Board Number: 72-M

Poster Title: Development of a risk stratification tool to guide frequency of remote pharmacist interventions in solid organ transplant patients

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Purpose: Rejection is the most significant complication follow solid organ transplant (SOT). Effective immunosuppressant regimens are paramount in preventing rejection, however, these regimens often result in side effects that result in poor compliance with the prescribed regimen. Frequent follow ups with trained clinical pharmacists have been shown to have a positive effect on medication adherence, health outcomes, and quality of life. Given limited resources for these interventions, we developed a risk stratification model to guide the frequency of telephonic follow up for patients following SOT.

Methods: Our specialty clinical pharmacists have historically used the Merck Adherence Estimator (MAE) to identify patients at risk of non-adherence. However, there is no data on the use of this tool in patients following SOT. Using the MAE as a starting point, we derived a new tool using an exhaustive literature review of risk factors for non-adherence in patients following SOT, combined with general trends of patients currently under our care. This lead to a 13-item tool that is used to screen patients for non-adherence, with a point value of 0-3 assigned to each item on the tool. Patients with scores of 14 (High Risk) are contacted in 4 months. Data is analyzed every two months and presented to the clinical team. Data from patients who are deemed high risk are separated out for further analysis. To assess adherence, proportion of days covered (PDC), the most commonly used adherence metric, is calculated for each patient.

Results: The historic average PDC for transplant patients under our care was 90% (2012-2017). In the calendar year 2018, following the initiation of the transplant specific adherence tool, PDC

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increased to 94% overall. Bi-monthly meetings allow for discussion of patients who are moderate to high risk, and encourage our clinical pharmacists to suggest how to better care for these patients. Pharmacist interventions made after using the tool included counseling on side effects, missed doses, use of medication reminder smartphone applications and mailing of refills for patients who do not have transportation.

Conclusion: The risk stratification tool has allowed for better efficiency in caring for patients following SOT. Future modifications of the tool based on the first year of data collection are ongoing. Additionally, we are exploring alternative methods of contacting patients at low risk such as text messages, emails and smartphone applications.

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

Poster Type: Descriptive Report

Session-Board Number: 1-T

Poster Title: Assessment of turnover, resilience, and well-being of pharmacy department employees at an academic medical center

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Purpose: The purpose of this study was to conduct a health system-wide pharmacy services assessment to identify and quantify trends in turnover, resilience, and well-being at the University of North Carolina Medical Center and University of North Carolina Health Care System. The primary aim of this study was to quantify turnover rates by job class code and cost centers within the Department of Pharmacy at University of North Carolina Medical Center. The secondary aim was to identify system-wide modifiable factors related to the work environment that contribute to turnover.

Methods: All University of North Carolina Medical Center Department of Pharmacy employee separations over one fiscal year were evaluated as part of the turnover assessment. The data for employee separations and headcount were compiled using pharmacy department vacancy and productivity reports respectively. Turnover rates were reported by individual job class code, cost center, and the Department of Pharmacy overall. As a component of the secondary aim, a robust survey instrument was distributed to all system pharmacy employees to measure factors related to turnover, resilience, and well-being. The resulting data was analyzed and reported using descriptive statistics.

Results: 10 of 14 total cost centers at University of North Carolina Medical Center experienced employee separations during the time period studied. There were 84 employee separations in

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the Department of Pharmacy overall, resulting in a turnover rate of 27%. The majority of separations occurred in the Pharmacy Inpatient Operations cost center, the Department of Pharmacy's main distributional area supplying the hospital. Significant turnover was also seen in the Pharmacy Decentral Services and Central Outpatient Pharmacy cost centers. The turnover seen in these cost centers were all pharmacy technician job class codes. Survey responses were received from a total of 267 system pharmacy employees with 212 completing the survey in its entirety. The responses received are representative of department of pharmacy employees across the system, with the majority of respondents being from the medium-sized or large city urban core geographic area (42.9%). The majority (90.2%) of respondents identified as full time employees, defined as working 40 or more hours per week.

Conclusion: Turnover is a major contributor to unexpected costs due to training and lost productivity and should be routinely monitored and addressed in pharmacy departments. Prior to this study, a complete assessment of turnover was not completed. The turnover assessment helped to identify job class codes and cost centers that experienced frequent employee separations. Furthermore, the survey highlighted several areas for further assessment. Overall, the needs differed across professional roles. This assessment helped identify job class codes and cost centers that would benefit from further assessment and intervention.

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

Poster Type: Descriptive Report

Session-Board Number: 2-T

Poster Title: Evaluating the effectiveness of drug formulary management in an academic medical center in Singapore

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Purpose: In reviewing a new drug for inclusion into the hospital formulary, apart from safety, efficacy and cost considerations, predicted usage is also important to avoid costly wastages. Singapore's National University Hospital is a public sector tertiary academic medical center (AMC), where stocking of very expensive (e.g. chemotherapeutics, biologics) and very rare drugs (e.g. orphan drugs for congenital diseases) is unavoidable. Consequently, high-cost and orphan drug policies were introduced to manage their usages within the hospital. This study explored the evaluation of the effectiveness of drug formulary management policies via a four-quadrant concept.

Methods: Dispensing quantities of drug items (excluding over-the-counter products) from both inpatient and outpatient pharmacies throughout year 2018 were analyzed. These were compared using private patient prices (before goods and services taxes) of items, for these prices were not complicated by various government subsidy schemes. The means of prices and quantities were computed to determine the cut-off lines of the four quadrants (low cost versus high cost, and low usage versus high usage). Distributions of items in each of the four quadrants were assessed.

Results: A total of 2217 drug items were dispensed. The mean price and usage of these items were S\$145.1 and 69320.6 units respectively, whereas corresponding median were S\$0.9 and 2457.0 units. There were 2035 items which cost lesser than mean price, versus 182 more than mean price. 1912 items had lesser than mean usage, versus 305 more than mean usage. Among

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items with higher than mean price, only 1 item had higher than mean usage, while 181 had lower than mean usage. For items with lower than mean price, 304 items had higher than mean usage, while 1731 had lower than mean usage.

The usage of lower cost drugs was 11.2 times higher than higher cost drugs. This was fair, since most patients seen in the hospital were public patients. Only natamycin eye drops, which costs ~S\$220 (before tax) per 15ml bottle, was used very commonly. This was justifiable, as alternative ophthalmic antifungals, are extemporaneous preparations with shorter expiries and higher prices. Most (85.1%) lower cost drugs were not as fast-moving with usages below the mean, suggesting the potential for deletions to reduce wastages.

Conclusion: Drug formulary management of our public sector tertiary AMC was reasonably good with cost containment due to several policies in place. There is potential to reduce drug wastages yet maintain good clinical services for complex patients while containing costs using careful formulary management policies.

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

Poster Type: Descriptive Report

Session-Board Number: 3-T

Poster Title: The role of real world evidence (RWE) to inform employer-based health benefit design and coverage policies: perspectives on axillary hyperhidrosis from an employer working group

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Purpose: Employers represent a major stakeholder in the US healthcare system. Approximately 66% of the non-elderly population (<65 years of age) receive healthcare coverage through employer-sponsored plans. To better understand factors employers consider to inform decision-making related to employee benefit design, an employer working group was convened. The purpose of this meeting was to understand how employers use real world evidence (RWE) and other data to inform benefit design decision-making, and to gather perspectives on a study concept designed to recruit and collect longitudinal data from employees and/or covered beneficiaries diagnosed with primary axillary hyperhidrosis (PAHH).

Methods: The Midwest Business Group on Health (MBGH) is a leading non-profit business group of mid and large, self-insured public and private employers. Through collaboration with a pharmaceutical manufacturer, MBGH invited their members to participate in a working group focused on hyperhidrosis (HH), a chronic medical condition characterized by sweat production beyond what is necessary to maintain normal thermoregulation. A pre-meeting survey was administered to gain insight around employers' familiarity with PAHH, key factors taken into consideration to inform benefit design, and how RWE about their beneficiaries influences their

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decision making. Objectives for the interactive working group meeting included employer education on the definition, etiology, and impacts of HH, and discussion of employer experiences with generating, interpreting and applying RWE to determine health benefits coverage. The final objective was to obtain feedback on the value and feasibility of a proposed study designed to measure workplace productivity and activity impairment associated with HH over time through collection of patient-reported outcomes data from covered beneficiaries with PAHH.

Results: Health benefit professionals from six employers participated: 2 jumbo (>100,000 employees), 2 large (10,001-50,000 employees), and 2 mid-sized (1,001-5,000 employees) companies. Four were from the manufacturing sector; the remaining 2 represented retail and finance companies. According to the pre-meeting survey, top factors impacting benefit design were cost, competitive benefits within their sector, and employee retention. Half of the participants reported they had experience collaborating with a research entity in the design and execution of a research study.

During the working group meeting, manufacturing-based employers expressed concerns about quality or safety-related issues that could arise from HH symptoms. However, all participants viewed the psychological impacts of HH as most relevant to employee productivity, with the potential to lead to behavioral modifications and hinder workplace performance. Participants considered the proposed study design to be an innovative way to better understand patient-reported impacts of HH, and recommended data collection over a longer period (>2 months) to accurately capture patient experiences over time. Concerns over employee confidentiality were identified as a potential barrier to collaborating with a pharmaceutical manufacturer on the proposed research initiative. Internal HH awareness initiatives in conjunction with the study could help to garner interest and destigmatize HH among employees.

Conclusion: Employers have a vested interest in the long-term optimization of the physical and emotional well-being of their employees to improve workplace productivity and maximize retention. In this working group focused on HH, employers across a range of sizes saw value in the collection and analysis of RWE to demonstrate long-term impact for employees and covered beneficiaries. They also recommended employee access to educational disease state resources to elevate awareness of HH. Focused collaborations between the pharmaceutical industry and employers represent an important tool to maximize collection and analysis of RWE and thereby inform decision-making for employee benefit design and management.

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

Poster Type: Descriptive Report

Session-Board Number: 4-T

Poster Title: Crosswalk analysis of emergency medicine pharmacist services versus ASHP guidelines and development of a needs-assessment tool

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Purpose: In 2011, the American Society of Health-System Pharmacists (ASHP) established a guideline to define the roles of an emergency medicine pharmacist (EMP). Nationally, Kaiser Permanente owns and/or manages 39 hospitals with emergency departments (EDs). As of September 2018, it was identified that there was no standardized process for establishing an EMP in the ED, or a tool to assess the need for services provided by an EMP. This administrative project was conducted to assist hospital and pharmacy administrators in establishing such a role and to develop a needs assessment tool for EMP services.

Methods: A multicenter, multistate survey was sent out via SurveyMonkey or conducted telephonically to inpatient pharmacy directors and/or their designee from 39 Kaiser Permanente hospitals to determine if they had established EMP services. For comparison, six non-Kaiser Permanente hospitals with established EMP services were also selected. The survey questions were used to determine the types of ED services provided, if there was a role for an EMP, what EMP services were provided and how the EMP services were justified. A crosswalk analysis of EMP services was completed and compared against the ASHP guideline. The objectives of this project were to identify different pharmacy services provided by the 39 Kaiser Permanente hospitals and the six non-Kaiser Permanente hospitals, to conduct crosswalk analysis of these EMP services compared to the ASHP guideline for EMP services, to recommend standardized essential pharmacy practice elements for EMP services nationally and to develop a point system tool to assess the need for EMP services in an ED with no EMP services.

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Results: Of the 39 Kaiser Permanente hospitals, five hospitals were identified to have EMP services in addition to the six non-Kaiser Permanente hospitals. EMP services were identified at Kaiser Permanente hospitals in Southern California (e.g., Fontana, Downey, and Panorama City); in Clackamas Oregon; in Honolulu Hawaii. The non-Kaiser Permanente hospitals with established EMP services consisted of Harbor UCLA, Fountain Valley Regional, Huntington Memorial, Northwestern Memorial, Tampa General, and VA San Diego. From the crosswalk analysis, all eleven hospitals that provided EMP services participated in seven of the 12 essential EMP services outlined by ASHP. Other EMP services varied among the five Kaiser Permanente and six non-Kaiser Permanente hospitals and were determined as unique services for each hospital. Upon completion of the crosswalk analysis, recommendations for standardized EMP services and processes were developed which included direct bedside care participation, having a separate work flow for an EMP to monitor as defined by the ED needs, medication reconciliation of high-risk patients based on the hospital's protocol, and participation in emergency preparedness planning. Lastly, a point system tool was developed to help assess the need for an EMP.

Conclusion: Unique EMP services varied hospital to hospital and included after hours inpatient glycemic program, after hours home health services, ambulatory care referrals, trauma activities, medication reconciliation, surgical services, and teaching. After conducting a crosswalk analysis of hospitals with EMP services against the ASHP guidelines, standardized EMP elements were recommended to establish a role of an EMP. In addition, a point system tool was developed for hospital and pharmacy administrators to assess the need for EMP services in their emergency department. Further studies are needed to validate the usefulness and accuracy of this point system tool in the future.

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

Poster Type: Descriptive Report

Session-Board Number: 5-T

Poster Title: Minimize risk associated with white bagging using a health-system based specialty pharmacy program

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Purpose: The practice of white bagging (WB) medications has become increasingly prevalent in the last few years. Insurance companies are shifting coverage of injectable and infused medications from the medical benefit to the pharmacy benefit to reduce costs to the plan. WB can represent significant risk for health-systems forcing them to compound and/or administer medications from external sources breaking the usual chain of custody and a loss of ability to ensure drug integrity. Health-system based specialty pharmacy (SP) programs offer one potential mechanism to maintain patient care while maintaining chain of custody of injectable and infused medications.

Methods: UMass Memorial Medical Center (UMMMC) is a 773 bed hospital in Worcester, MA . UMMMC operates a 60 chair infusion center which provides comprehensive infusion services. UMMMC has a centralized Pharmacy Business Office (PBO) who evaluates benefits and prior authorization needs for all infused and injected medications for UMMMC. UMMMC implemented a specialty pharmacy in 2012. WB began to become more prevalent and in 2017 we formed a group to explore how the on-site specialty pharmacy might be able to service these patients. We mapped the current state workflow and then determined if we place a specialty pharmacy liaison (SPL) in the the PBO team, the PBO team could triage patients with insurance plans requiring specialty pharmacy billing for infused and injected medications using

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established electronic medical record (EMR) work queues. The SPL would then complete benefits investigation (BI), work with the provider to obtain the prior authorization (PA), and evaluate eligibility for financial assistance (FA) for any medication with a copay over \$5. If the health-system SP could fill the prescription, this would be offered to the patient. If not, the SPL would coordinate prescription fulfillment and delivery with the external SP. The SPL documents a standard note in the EMR with the results of the BI, PA and FA in addition to which pharmacy would be filling the prescription.

Results: The workflow was implemented in May 2018. From May 2018 to January 2019, 327 medication requiring specialty pharmacy benefit were identified by the PBO. A total of 266 (81%) of prescriptions were filled internally at the health system SP. Most frequently encountered reasons for filling externally were payor lockout and patient choice. Fulfillment of WB medications at the health-system SP as led to \$1.1 million of annualized revenue. The average copay for medications provided by the SP was \$9. All medications provided by the health-system SP were ordered maintained within the health-system chain of custody, were purchased from the health-system approved distributor, stored according to health-system policy and there was no identified waste. About 15% of medication sent in from external SP were not administered and were counted as waste.

Conclusion: Internalizing WB through a health-system based SP provides an opportunity to streamline care coordination, ensure drug pedigree, minimize chain of custody risks, and avoid revenue loss for the health-systems associated with external SPs. Future direction will include engaging with the health-system contracting department to minimize the impact of transitions from medical to specialty benefit and identify additional areas within the health-system impacted by external WB.

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

Poster Type: Descriptive Report

Session-Board Number: 6-T

Poster Title: Evaluation of inpatient pharmacy technician staffing distribution following implementation of an automated medication distribution system

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Purpose: Implementation of an automated medication distribution system presents both opportunities for improvement and logistical challenges. Desired improvements included a cart-less system to improve customer service, added safety features with enhanced barcode scanning, and improved inventory management with a focus on inventory turns and efficient ordering from the manufacturer. One logistical challenge identified upon initiation was resourceful use of inpatient pharmacy technicians to service all automated areas in a timely manner. This project was designed to determine staffing resource allocation following implementation of an automated medication distribution system.

Methods: A pharmacist and administrative officer, both with working knowledge of pharmacy operations, objectively observed all inpatient pharmacy technician shifts to obtain a complete evaluation of workflow throughout the day. Four, staggered, dayshifts and one overnight shift were observed over weekdays and weekends. Observations included documentation of all current scheduled and unscheduled duties. Scheduled duties, in sequential order, included medication stocking in the central pharmacy, pulling medications for distribution from the automated vertical storage system, delivering medications to the medication rooms, and stocking the medications in automated dispensing cabinets (ADCs). Medication pulling from the automated vertical storage system was scheduled daily to begin at 6:00 AM, 5:00 PM, and 8:00 PM. Unscheduled duties included phone calls, missing doses, pages, medication pre-packing,

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monthly medication storage inspections, and miscellaneous customer service requests. Objective observations were immediately documented and aggregated to identify trends and opportunities for intervention. These data were then validated by frontline supervisors and inpatient pharmacy technicians.

Results: Six different shifts were shadowed over eight days. Scheduled duties primarily occurred during the dayshift when there were up to four technicians staffing, depending on the time of day. At most, there were four technicians on staff from 11:30 AM to 2:30 PM. Throughout the dayshift, technicians were interrupted more frequently by urgent, unscheduled duties resulting in delays or inability to complete scheduled duties. Additionally, medication room stocking was frequently interrupted by nursing's need to access ADCs for timely patient care during the dayshift. During overnight shifts, interruptions from unscheduled duties were much less frequent, however, scheduled duties that required leaving the central pharmacy were difficult to complete as there was only one pharmacy technician in the hospital. The limited overnight technician staffing also decreased the ability to assist with dayshift workload that was not completed on schedule.

Conclusion: Results identified opportunities to improve efficiency, without requesting additional staff, by moving some scheduled duties and two technicians from dayshift to overnight. This movement may result in more efficient completion of scheduled duties, timelier customer service, and completion of unscheduled duties during the dayshift. Institutions considering the implementation of an automated medication distribution system should evaluate their staffing model to determine opportunities for adjustment with current staff. This may result in more efficient use of staffing resources while adding the benefits of an automated medication distribution system that focuses on customer service, safety, and inventory management.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 7-T

Poster Title: Diabetes management by transitions of care clinical pharmacists in the post-hospital discharge setting for patients without an established primary-care provider

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Purpose: JPS Health Network's post-hospital discharge clinic serves the indigent population who have been recently discharged from the hospital and are not established with a primary-care provider (PCP). Patients may need to wait anywhere from a week to several months before establishing care with a PCP at one of the JPS patient centered medical homes (PCMHs). A transitions of care clinical pharmacist (TOC PharmD) was integrated in the post-hospital discharge clinic in 2016. The purpose of this quality improvement study is to describe a TOC PharmD service to improve diabetes outcomes post-discharge in an indigent patient population without an established PCP.

Methods: Patients without a PCP who were discharged from the hospital were referred by the clinic providers to the TOC PharmD for comprehensive diabetes medication management. The pharmacist worked under a collaborative practice agreement for referred patients and was permitted to make changes to a patient's therapeutic regimen in accordance with the evidence-based guidelines. The TOC PharmD clinically managed the referred patients until they were established with a PCP. A retrospective review of the TOC PharmD service was deemed a quality improvement study by the JPS office of clinical research. Data was collected for patients referred to the TOC PharmD for diabetes management beginning in February 2017 through September 2018. Patient's baseline hemoglobin A1c was defined as the result collected during the patient's recent hospitalization or collected at the initial post-hospital discharge clinic visit. The post-intervention hemoglobin A1c was defined as a result approximately 3 months after initial TOC PharmD visit. Dates for the initial TOC PharmD visit and first establish care visit with

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the patient's new PCP were recorded. Patients were tracked to determine if they were lost to follow-up at any time period between hospital discharge and establishing care with a PCP. The primary objective was to evaluate the percentage change in hemoglobin A1c before and after TOC PharmD intervention. Descriptive statistics were used to summarize the data.

Results: During the 19 month period, 398 patients were seen by the TOC PharmD for at least one clinic visit. The average baseline hemoglobin A1c of referred patients was 11.3 percent with a standard deviation of 2.7. Fifty-six percent (n=223) of patients had a post-intervention A1c result, with the remaining patients still pending, lost to follow-up, or established with an outside clinic. For those who were not lost to follow-up, the time between TOC PharmD visit and new PCP visit averaged 47 days. Of the 223 patients who completed a hemoglobin A1c post-TOC PharmD follow-up, 191 patients (86 percent) had an A1c decrease approximately three months later. Of the 191 patients with a hemoglobin A1c decrease, there were 139 patients (73 percent) that had an A1c that decreased to less than 9 percent (organizational metric goal) after seeing the TOC PharmD. The average percentage change in A1c was a 23.4 percent reduction for patients who completed a hemoglobin A1c post-TOC PharmD visit.

Conclusion: This is an innovative pharmacy service catered to patients who have not established themselves with a PCP and normally would not have a system to bridge diabetes management to establishing with primary care. Implementation of a TOC PharmD service in the post-hospital discharge clinic has successfully improved diabetes outcomes while bridging the gap from hospital discharge to PCP follow-up.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 8-T

Poster Title: First year of pharmacogenetics testing at TIRR rehabilitation hospital

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Purpose: To assess the prescribing practices of physicians offered a new pharmacogenetics test at TIRR and to assess the quality and quantity of alerts the test provides

Methods: TIRR-Memorial Hermann is a 120 inpatient bed rehabilitation hospital with an outpatient clinic that specializes in brain injury and spinal cord injury neuro-rehabilitation in Houston, Texas. In winter of 2017, a pharmacogenetics test offered by Rxight was made available to physicians at TIRR. Physicians and prescribers were introduced and given training on the test in January 2018. One year post-introduction, we retrospectively reviewed charts of patients administered the test - identifying who ordered the tests, the indication for the test, and the type and quantity of drug-gene alerts in the test results

Results: During its first year, physicians ordered the pharmacogenetics test for 90 patients. The majority of tests were ordered by a single physician who primarily ordered the test for patients in the outpatient clinic. All patients tested had a drug-gene interaction to one or more medications. Of the tested patients, 32% had reduced CYP2C19 activity, which has implications for clopidogrel use in these patients. Indeed some of these patients were previously treated with clopidogrel in the past or were on it at time of testing.

Conclusion: During its first year at TIRR Memorial Hermann, the pharmacogenetics test panel at TIRR has had some use. However, that the majority of tests was ordered by a single physician suggests that either initial test introduction and training was insufficient to change practice or most physicians do not see believe there is enough clinical utility for pharmacogenetics testing in their practice. Future research will focus on the clinical impact and utilization of the test information.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 9-T

Poster Title: Implementation of ambulatory pharmacist visits for protocol-driven guideline directed medical therapy in patients with heart failure with reduced ejection fraction

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Purpose: Guideline directed medical therapy (GDMT) has demonstrated improved outcomes for patients with heart failure with reduced ejection fraction (HFrEF). Despite the established benefits of targeting specific doses of medications proven to improve mortality and/or reduce hospitalizations in this population, many heart failure patients remain on suboptimal doses. The implementation of pharmacist-led GDMT visits aims to increase access to care, improve medication use, provide education, and safely titrate evidence based heart failure therapy.

Methods: A protocol for heart failure guideline-directed medical therapy was approved by the institution's pharmacy and therapeutics committee. This protocol allows the pharmacist to initiate or adjust evidence-based heart failure medications and order laboratory tests for routine monitoring. Patients were referred to the pharmacist through an enrollment order within the electronic medical record which detailed medications to be adjusted and preferred order for titration. Eligible patients had a diagnosis of heart failure with reduced ejection fraction; ideal candidates were euvolemic and without acute worsening of symptoms. GDMT pharmacist visits were conducted within a multidisciplinary clinic that includes licensed independent practitioners, registered nurses, social workers, pharmacists, and licensed practical nurses. Patients were scheduled for 60 minute pharmacist visits comprised of a complete medication review, measurement of pertinent vitals, symptom assessment, a focused

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physical exam for evaluation of fluid status, and medication adjustments according to the GDMT protocol. If a patient did not meet criteria for medication adjustment per protocol, a physician or licensed independent practitioner was consulted for further evaluation. Patients were followed primarily through face-to-face visits at approximately two week intervals, with blood pressure or weight monitoring by telephone as appropriate. Discharge from pharmacist GDMT service occurred if a patient achieved target or maximum tolerated doses of all medications, was lost to follow-up, or was no longer a candidate for routine medication titration.

Results: During the initial evaluation period from November 2018 – February 2019, 29 patients were referred to the pharmacist service, resulting in 97 GDMT visits. There were 48 visits completed per protocol which resulted in either a medication adjustment or no change to therapy per protocol instruction. The most common reasons for off-protocol visits were out-of-range vitals, worsening symptoms, or volume overload. Guideline directed medications were initiated or doses were increased in 42 percent of all GDMT visits, with 71 percent of these adjustments completed per protocol. Evidence-based beta blockers were most commonly adjusted (20 visits), followed by angiotensin receptor-neprilysin inhibitors (11 visits), and hydralazine/nitrate (10 visits). At the end of the initial measurement period, two patients graduated from GDMT service on target doses of all medications, and two patients graduated on maximum tolerated doses. Both individuals graduating below target doses experienced symptomatic hypotension preventing further titration. An additional six patients were discharged from GDMT services without reaching target doses; discharge reasons were lost to follow-up (2 patients) and return to disease management nursing program for volume management and additional education (4 patients).

Conclusion: Pharmacist-led GDMT visits were successfully implemented within a multidisciplinary ambulatory clinic through the use of a protocol and collaboration with a physician or licensed independent practitioner. The development of this service allowed patients to see a pharmacist provider on a frequent basis and ensure guideline directed medications were initiated and titrated as efficiently as possible with proper monitoring. A larger patient sample will be needed to assess the impact of pharmacist-led heart failure management on clinical outcomes such as improvement in ejection fraction and reduction in hospitalizations.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 10-T

Poster Title: Implementation of a pharmacist-driven quality initiative to improve hypertension control in a family medicine clinic

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Purpose: Hypertension remains one of the most crucial modifiable risk factors for the prevention of cardiovascular events and progression of chronic kidney disease. Ideal targets for blood pressure (BP) vary across different guidelines; however, it remains widely accepted that less than 130/80 mmHg is a safe and optimal goal for most patients. Clinical pharmacists in the ambulatory setting are in a unique role, as they are able to provide direct patient care while also working side-by-side with their physician colleagues. The purpose of this quality improvement initiative was to improve blood pressure control through pharmacist-physician collaboration in a family medicine clinic.

Methods: This single-center, prospective, quality improvement initiative aimed to identify patients with uncontrolled hypertension and optimize BP control within a large, academic, patient-centered medical home. We included a convenience sample of patients who had a most recent BP value greater than 160/100 mmHg and were assigned to a specific multidisciplinary primary care provider (PCP) team. Patients were excluded from pharmacist intervention if they had not had an encounter with a provider at our clinic within six months or if their BP was within goal range at first clinic appointment. This pharmacist-led initiative focused on adjusting antihypertensive medication regimens, providing adherence counseling, and ensuring appropriate monitoring and follow-up. Pharmacist intervention was performed during in-person clinic visits and via telephone. The primary outcome was the number of patients who reached their individualized BP target, after pharmacist intervention. Secondary outcomes

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included percent reduction in systolic BP, time to reach BP goal (days and individual encounters), number and type of pharmacist interventions per patient, and type and frequency of identified barriers to adherence.

Results: A review of initial data identified 119 patients with a most recent in-office BP value greater than 160 mmHg systolic or greater than 100 mmHg diastolic. Seventy-five (65.2 percent) patients were excluded from data analysis (39 (52.0 percent) had not been seen in our clinic within the previous six months and 36 (48.0 percent) had a BP value less than 140/90 mmHg at first clinic appointment), leaving 44 (36.9 percent) patients eligible for pharmacist outreach and intervention. Of eligible patients, 27 (61.4 percent) have received clinical pharmacist intervention and 20 (74.1 percent) patients have required pharmacist-recommended changes to their antihypertensive medication regimens (average of 2.1 medication changes per patient). To date, intervention and follow-up has been completed for 18 (66.7 percent) patients. Among patients with completed data sets, 100.0 percent have achieved a reduction in systolic BP (average reduction – 33.1 mmHg [minus 18.7 percent from baseline]) and 14 (77.8 percent) have reached their individualized BP goal (median time to goal BP – 44 days). Four (14.8 percent) patients have been lost to follow-up after initial clinical pharmacist intervention. Additional outcome results and data for patients currently being managed by clinical pharmacist are pending.

Conclusion: In this pharmacist-led, quality improvement initiative, a majority of patients who received pharmacist intervention achieved individualized BP goals. The results of this service demonstrate the benefits of a clinical pharmacist in the ambulatory setting and underscore the importance of pharmacist-physician collaboration to achieve improved outcomes in patients with uncontrolled hypertension.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 11-T

Poster Title: Utilizing shared medicare annual wellness visits (AWVs) as a sustainable model to embed clinical pharmacists in a primary care setting

Primary Author: Julie Lernihan, Maine Health; **Email:** jlernihan@mmc.org

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Purpose: Incorporating pharmacists in the primary care setting provides many beneficial services to patients and providers. Pharmacists are highly utilized medication experts and improve clinical outcomes in chronic disease-state management. Financial support can be a barrier to pharmacist integration in a primary care setting due to limited billing opportunities without provider status. The purpose of this review is to evaluate the impact of utilizing shared medicare AWVs amongst provider and pharmacist to increase patient access, generate additional revenue, and support the clinical pharmacist position.

Methods: Shared medicare AWVs were implemented at two primary care practices throughout southern Maine and were retrospectively reviewed from October 2017 to October 2018. Medicare AWVs were previously scheduled as 45 minutes with the provider alone, whereas, shared visits are scheduled as 30 minutes with the pharmacist followed by 30 minutes with the provider. The shared-visit model opens a 15 minute appointment on the provider schedule, improving patient access and generating additional clinic revenue.

In order to support the shared AWV model, workflow changes included adjusting pharmacist scheduling templates and adjusting the process for patient outreach and scheduling of visits. One impactful change included allowing appointments to be scheduled more than 30 days in advance, thus increasing pharmacist and provider availability. Another impactful workflow change included removing scheduling limits from the pharmacist schedule, which capped the number of shared AWVs that could be completed per half day.

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The primary outcome assessed was the number of additional office visits generated using the shared-visit model. The number of newly created appointments on the provider schedule and consequent fill rates were used to determine change in patient access and impact on clinic revenue.

Results: Utilizing the shared AWV model created 626 and 542 additional office visits on the provider schedule throughout the year at Practice 1 and Practice 2, respectively. The fill rate of these opened slots was 95.05 percent at Practice 1 and 83.76 percent at Practice 2. This generated an additional \$235,162.64 in total charges for the institution.

The shared visit model is sustainable in clinics with a 30/60 minute appointment scheduling template. Practice 2 transitioned to a 20/40 minute template in August 2018 which decreased shared visit volume. This decrease may have also been affected by limits placed on the pharmacist schedule. Once the limits were removed in October 2018, shared visit volume improved. Overall, it took Practice 1 six months to reach target joint AWV volume and the practice either continued to meet or exceed target through October 2018.

Conclusion: The shared medicare AWV model is a viable method to embed clinical pharmacists in a primary care setting. The revenue generation from creating additional openings on a provider schedule can help offset pharmacist salary while pharmacist reimbursement opportunities are limited. These additional appointment openings on the provider schedule also improve access to care. Shared AWVs can serve as a referral source for future independent medication management-focused office visits with the clinical pharmacist and will establish pharmacists as an integral member of the interprofessional primary care team.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 12-T

Poster Title: Evaluation of pharmacist- or nurse-driven long-acting insulin titration protocol in adult primary care patients with type 2 diabetes

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Purpose: It is well known that managing diabetes and associated hyperglycemia can prevent microvascular and macrovascular complications, however many patients with diabetes do not achieve optimal control due to disease complexity and therapeutic inertia. Studies have supported protocolized insulin titration as a way to optimize insulin therapy. This study evaluates the implementation of a long-acting insulin titration (LAIT) protocol in the primary care setting with nurse care manager or clinical pharmacist-driven dose titration algorithm. The purpose of the study is to evaluate the performance of the LAIT protocol and assess metrics that might be used to inform future program improvement.

Methods: This retrospective analysis of data collected from July 1, 2016 to January 23, 2019 at multiple primary care practices throughout Southern Maine was deemed a quality improvement project by the Maine Medical Center Institutional Review Board. Patients included were 18 years of age or older with type 2 diabetes (T2D) and a hemoglobin A1C (A1C) greater than 8 percent who were able to follow the requirements of the LAIT protocol (e.g. perform daily blood glucose testing, maintain contact for titration every three days). Demographic and clinical data were summarized as mean plus or minus standard deviation (SD) or median (interquartile range, IQR), as appropriate (continuous data) and as frequency (n, percent) (categorical data), and were described overall and after stratification by protocol version. Our primary outcome measure for protocol performance was the change in A1C value

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between pre-protocol enrollment and post-protocol measurement. Paired pre-post difference in A1C was evaluated by the Wilcoxon signed rank test.

Results: Among 463 patients identified with T2D, 204 patients aged 26-88 years (mean age 60.0 plus or minus 11.8 years) from 10 practices were eligible for inclusion in the analysis. Nurse care managers managed 180 (87.8 percent) patients on the LAIT protocol while 25 (12.2 percent) were managed by a clinical pharmacist. Patients enrolled in the LAIT protocol experienced a significant decrease in A1C (from 9.97 plus or minus 1.85 percent pre-referral to 8.60 plus or minus 1.67 percent post-referral, p less than 0.001; the median absolute change in A1C was -1.0 [interquartile range, -2.48 - -0.10]). Overall, an A1C of less than 8 percent was achieved in 77 (37.7 percent) patients, and 31 (15.2 percent) patients achieved an A1C of less than 7 percent. During version 1 of the protocol, there was a median 1.10 percent absolute decrease in A1C (9.92 plus or minus 1.85 percent pre-referral and 8.56 plus or minus 1.70 percent post-referral) compared to a median 0.70 (IQR, -2.3- -0.1) absolute decrease in A1C (10.21 plus or minus 1.83 percent pre-referral and 8.79 plus or minus 1.48 percent post-referral) during version 2.

Conclusion: The implementation of a LAIT protocol in the primary care setting was associated with significant decrease in A1C and may further improve management of T2D. Through involvement in the LAIT protocol, clinical pharmacists and nurse care managers provided an important contribution to the care team and aid in achieving glycemic goals amongst patients with T2D. Future study considerations for assessment of the LAIT protocol include comparing A1C change to patients managed with standard primary care intervention, and increasing study population size. The evaluation of the titration algorithm will guide changes to allow for improved referral utilization and patient engagement.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 13-T

Poster Title: Implementation of evidence-based substance use disorder primary prevention education with community partners

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Purpose: The current widespread misuse of addictive substances remains a major public health challenge. Because pharmacists have unique knowledge and skills, they are valuable participants in community primary prevention coalitions when collaborating with community partners and engaging in public health education. This activity will describe how coalition members across many sectors employed a primary prevention model, seeking to implement programs and strategies that educated the greater community as a whole and youth in particular on the risks of using substances. The Center for Disease Control defines primary prevention as—intervening before health effects occur, through measures such as altering risky behaviors.

Methods: Individual coalitions made up of stakeholders from various sectors including schools, health care (including pharmacists), law enforcement, elected officials, social services, parents, and students in twenty-six geographically adjacent municipalities engaged in various evidence based primary prevention strategies. Interventions included a positive norms campaign in the schools, speaker presentations and world-cafe style discussions for both students and parents, fun public service announcements concerning making healthy choices, peer-to-peer engagement, and many others. Pharmacists brought expertise and information to various aspects of need assessment, program design, development, and implementation. During planning and implementation, coalition members shared passion, collaboration, and cooperation.

Survey data from the Regional Health Survey provided a basis to evaluate individual community and global trends for the twenty-six municipalities in the region during the study period. The

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comprehensive Regional Health Survey has been administered biennially to middle and high school youth in the region since 2006. Historically reliable, self-reported data has been collected on many high-priority health and risk behaviors including substance use, mental health, violence, and physical activity. Also, it has captured data on emerging and evolving behaviors in the adolescent population, such as cyberbullying, sexting, prescription drug misuse (including opioids), and use of electronic cigarettes.

Results: During the time period of more than a decade, while sector members brought individual talents to a collaborative prevention process, data-driven improvements in health programs and practices have resulted for youth both locally and regionally. According to survey data, substantial improvements have occurred in many areas. Among youth, cigarette smoking in the region is now at one-third the levels of 2006. Alcohol and substance use including prescription drugs continue a downward trend. Although there are still serious concerns of current population level opioid misuse, among the region's youth lifetime reports of misusing prescription drugs were similar from 2006 to 2010 at 10 to 11% and then decreased over the last three surveys to 6%. Of concern is the area of mental health where reported stress among youth continues to climb, particularly among girls. Factors contributing to mental health issues are complex, yet during the 2018 survey observed were small increases in both youth use of marijuana and reported feelings of depression. Youth who report having protective factors, such as a supportive adult outside of school to talk to, report lower levels of harmful behaviors including substance use.

Conclusion: "Pharmacists, as healthcare providers, should be actively involved in reducing the negative effects that substance abuse has on society, health systems, and the pharmacy profession" (approved by the ASHP Board of Directors and the ASHP House of Delegates, 2015). Utilizing evidence-based strategies, pharmacist community coalition participation is one avenue to reach this goal. During the study period, overall decreases in youth substance use correspond to anticipated improvements in health outcomes at the individual and population levels.

We are better together working for healthy communities.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 14-T

Poster Title: Implementation of a new pharmacist-run osteoporosis service in a multi-clinic physician medical group

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Saba Rab

Purpose: The use of costly medications for osteoporosis management prompted our healthcare system, which is comprised of 5 hospitals and 28 clinics, an accountable care organization and a health plan, to reevaluate the clinical appropriateness as well as cost effectiveness of current treatments. An evaluation identified denosumab (Prolia) as a major contributor to healthcare costs due to high overall drug cost, low payor reimbursement and frequent referral to specialty services. Our goal was to establish a pharmacist-run osteoporosis service to improve overall efficiency in the drug delivery process, curb rising healthcare costs, and improve the patient experience.

Methods: After identifying eight clinics to participate in the service, the treatment algorithm and collaborative practice agreement were developed and approved by the P&T committee. All staff including physicians, nurses, and medical assistants were trained on the new processes for ordering Prolia and referring to the pharmacist service. A workflow was developed with the central prior authorization department and internal retail pharmacies to coordinate processing claims and delivery of Prolia. After receiving a referral from primary care physicians, a comprehensive evaluation of patients' osteoporosis was conducted telephonically—including a detailed history of osteoporosis treatment, a comprehensive medication review, counseling on therapeutic lifestyle modifications for osteoporosis management and education on fall prevention. Under the collaborative practice agreement, pharmacists were able to initiate, modify, and discontinue therapy as well as order any labs and procedures necessary under the guidelines. The most cost-effective and clinically appropriate treatment was discussed in detail and prescribed. For those patients where denosumab (Prolia) was ordered, the pharmacist also

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administered the injection. Follow up was determined based on individual patient needs but generally patient follow up occurred 1-2 weeks after initiating therapy and again about 4 weeks prior to the next treatment or DEXA due date.

Results: The pharmacist service received 455 referrals from 8 primary care clinics and 2 rheumatologists between 9/1/18 and 3/15/19. The average time from referral to initial pharmacist consultation was 16 days. Two pharmacists completed 345 initial consultations which averaged 60 minutes in length. Oral bisphosphonates were prescribed for 57 patients, denosumab for 146 patients, zoledronic acid for 53 patients, a PTH-analog for 2 patients and a drug holiday was determined to be appropriate for 6 patients. Sixteen patients declined to participate in the pharmacist service.

Cost savings to the organization was estimated at \$90,200 from direct retail pharmacy revenue, cost savings by minimizing use of specialty providers, and cost avoidance from pharmacist interventions.

Conclusion: Working under collaborative practice agreements, the pharmacist were able to choose clinically appropriate treatment for patients while reducing overall health system costs. Additionally pharmacists were able to spend significantly more time with patients in counseling than a traditional physician visit allows. Patient satisfaction surveys to assess response to the program are in development but verbal feedback has been positive.

The service has been well-received by health system leadership, referring physicians, medical staff and patients. There is significant interest in expanding the service to include all medical clinics in our health system, however expansion is currently limited by staffing resources.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 15-T

Poster Title: Analysis of interventions by the ambulatory care pharmacist at sutter health east bay medical foundation

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Purpose: To quantify and categorize interventions made by the ambulatory care pharmacists at Sutter East Bay Medical Foundation (SEBMF) over the span of 19 months in patients with chronic disease states such as diabetes, hypertension, and dyslipidemia. The interventions were analyzed to determine the percentage of interventions accepted by providers, patient cost savings, and classify the severity of patient reported adverse drug reactions using the National Coordinating Council for Medication Error Reporting and Prevention Index for categorizing medication errors.

Methods: A retrospective review of intervention data that was collected by the ambulatory care pharmacist in the SEBMF clinic over a period of 19 months between October 2016 and May 2018. Patients are referred to the ambulatory care pharmacist by providers in the clinic for medication therapy management and management of chronic disease states including diabetes, hypertension, and dyslipidemia. Pharmacist's interventions were classified into four categories: (1) Attainment of therapeutic goals (Drug dose inappropriate for treatment goal, Laboratory monitoring, or Adverse drug reaction), (2) Adherence (Polypharmacy/duplication, or Patient non-adherence), (3) Cost savings (Non-cost effective drug), and (4) Other. When the intervention was documented the provider's acceptance or rejection was recorded by the pharmacist and this data was used to calculate the provider acceptance rate. For those interventions that resulted in patient cost savings the patient's monthly cost savings was calculated by subtracting the final monthly copay (after pharmacist intervention) from the original monthly copay (prior to pharmacist intervention). Patient reported adverse drug

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reactions were classified by severity using the National Coordinating Council for Medication Error Reporting and Prevention Index for categorizing medication errors.

Results: A total of 1,091 interventions were included in the analysis. The prevalence of interventions by category is as follows (1) Attainment of therapeutic goals 41%, (2) Adherence 42%, (3) Cost savings 5%, and (4) Other 14%. The percentage of interventions accepted by providers was 97.9%. The patient cost savings per month was \$12,347 and the annual patient cost savings as a result of pharmacist interventions was \$148,160. The pharmacist intervened on 52 patient reported adverse drug reactions. Interventions included discontinuing the drug, substituting an alternative agent or dosage form, changing the dose or interval, and educating the patient. Sixteen of these adverse drug reactions fell in category A to D with no or minimal harm, twenty-two events fell in category E with potential for moderate to minimal harm, and one category F event occurred with potential for moderate harm.

Conclusion: This retrospective analysis provides insight into the ambulatory care pharmacist's role in identifying drug therapy problems and making interventions. Pharmacist interventions can result in patient cost savings to the tune of \$148,160 per year. Pharmacists can also improve patient care through adjustment of drug regimen to attain therapeutic goals, increasing medication adherence, improving medication accessibility, and managing patient reported adverse drug reactions.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 16-T

Poster Title: Evaluation of pharmacy services at a free-standing emergency room (ER)

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Purpose: Free standing ER's are growing in the US as an alternative to hospital-based emergency care due to easy accessibility and less waiting times. 24/7 Care Center (24/7 CC) is an example of a free standing ER affiliated to Memorial Healthcare System, and located in the city of Pembroke Pines.

There has recently been an increased acuity of the site's patient population using high alert drugs. Based upon the employee's request for more pharmacist hours, a retrospective study was performed to evaluate the possible role of a full-time pharmacist based on the site.

Methods: Retrospective data was collected from EPIC records over four years (2015-2018) during the same time period January 1st to June 30th. Demographics, census, prescription orders, and medication error records were analyzed. The results were reported as daily averages (i.e the total number of patients, prescription orders, medications errors over the six-month period was divided by the number of days of between January 1st and June 30th of that year). The increase or decrease over the four-year period were reported as percentage(s). Chronic diseases were defined for the purpose of the study as diabetes mellitus, hypertension, heart failure and asthma where a pharmacist's intervention has been shown to have a positive patient outcome. Category C-E errors were defined as errors that reached the patient whether or not harm/injury occurred based on the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) drug error classification.

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Results: The daily census increased by 15% over the four year period. The children's population (age 0-12years) grew by 27%, while the elderly population (age over 60years) grew by 20%. The age groups between 13-34years and 35-59 years range grew by 9% and 16%, respectively. An average of thirteen patients were transferred daily to an affiliated hospital ER as high acuity or emergent cases, and at least 50% of these patients were admitted into hospital. The number of prescription orders in EPIC grew by 28% over the same time period. An average of seven patients a day had a history of a chronic disease which was an increase from 2017 to 2018 of two more patients a day. The number of medication errors of severity Category C to E accounted for 80% of all medication errors reported.

Conclusion: With the increasing census and the acuity of 24/7 Care Center patients, there may be a future role for more pharmacist hours. Daily responsibilities may include performing medication therapy management for defined patients with chronic diseases, medication reconciliation of transferred patients, counseling, orders review and staff education. The pharmacist can perform these roles under a defined protocol of responsibilities in collaboration with the medical and nursing team

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 17-T

Poster Title: Ambulatory pharmacy electronic consultations: the right prescription in our evolving health care environment

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Purpose: Electronic consults serve as an excellent educational tool for primary care providers in a complex health care system serving as a bridge to foster collegiality and collaboration between specialty care and primary care. They encourage a team based approach to patient care while enhancing the patient experience through timely access to specialty expertise. Ambulatory Care Pharmacists can easily foster relationships with providers, avoid cost in care, and improve employee and patient satisfaction.

Methods: eConsults were introduced as part of the CMMI CORE (Coordinating Optimal Referral Experiences) project in 2015. Since their initiation, thirty-six specialties have chosen to participate in this care model. Ambulatory Pharmacy is an uncommon specialty participating. Ambulatory Pharmacy eConsults can help improve patient care and reduce overall health care costs in a dramatic way. This specialty's main focus, which is to provide patient care that optimizes the use of medication and promotes health, wellness, and disease prevention, is perfectly aligned with a high-value care model. We will demonstrate how Ambulatory Pharmacy eConsults deliver on all four components of the "quadruple aim": improving population health, increasing patient satisfaction, reducing per-capita health care spending, and improving clinician/care team satisfaction.

Results: Ambulatory Pharmacy receives an average of 28 eConsults per month which is the most highly requested eConsult specialty by PCPs on a monthly basis in comparison to the other thirty-six specialties. This is in contrast to national data which shows that Hematology and

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Endocrinology are consistently the top specialties receiving eConsults across systems (Vimalananda et al²). Our preliminary data shows that 328 medication-related questions were derived from a total of 159 eConsults sent to Ambulatory Pharmacy between April 2017 and November 2017. Of the medication-related questions, 33% were informational and 49% were recommendations to improve care. The latter category had a 93% acceptance rate by primary care providers. Utilizing the nationally accepted formula developed at the Veteran's Administration referenced in the 2002 article published in the American Journal of Health-System Pharmacy by Lee et al.³, we were able to calculate "cost avoidance" for the accepted pharmacy interventions. Our preliminary findings with only eight months of data available shows that of the 149 "accepted" Ambulatory Pharmacy recommendations noted, over \$75,000 were saved in "cost avoidance".

Conclusion: We expect the cost savings to continue to grow over time. One can infer the interventions would lead to improved patient outcomes and were able to see positive impacts on all four arms of the quadruple aim.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 18-T

Poster Title: Assessment of pharmacist interventions in a multisite pharmacotherapy program

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Purpose: Pharmacists have been involved in collaborative drug therapy management (CDTM) for several years at Renown Health. Currently, 7 pharmacists see patients in 8 different locations throughout the Reno, NV area. To date there has not been an assessment of their patient care interventions. This study was designed to quantify and categorize pharmacist interventions for patients referred to the Renown Health Pharmacotherapy Program.

Methods: A retrospective review of EPIC electronic medical records was performed for patients with a completed outpatient pharmacotherapy visit within Renown Health from February 1, 2018 to July 31, 2018. Patients were excluded if their visit was for anticoagulation management. Pharmacist interventions were categorized using the Pharmacy Quality Alliance's Medication Therapy Problem (MTP) Categories. Descriptive statistics were utilized to analyze pharmacist interventions.

Results: 298 patient visits were identified for inclusion in the study. The majority of patients had either Medicare (50.5%) or commercial coverage (42.7%). Patients were seen for a variety of disease states including hyperlipidemia (120, 40.3%), diabetes (80, 26.8%), hypertension (68, 22.8%), and polypharmacy (30, 10%). There was an average of 2.1 MTPs identified per patient visit. The most common MTPs identified by pharmacists were: "Needs additional monitoring" (238, 79.9%), "Needs additional medication therapy" (109, 36.6%), and "Dosage too low" (67, 22.5%).

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Conclusion: Pharmacists at Renown Health involved in CDTM typically identify and resolve multiple medication related problems during pharmacotherapy visits. At the majority of pharmacotherapy visits pharmacists are identifying that patients require intensification of their medication regimen and additional monitoring.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 19-T

Poster Title: Nomi, an innovative platform for monitoring and maintaining adherence to hepatitis C treatment

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Purpose: Adherence to direct acting antiviral therapy for hepatitis C therapy is a key determinant to achieve SVR. The Nomi system is an innovative combination of real-time monitoring software with medication sensor hardware that facilitates patient and team interactions via a mobile device and web portal. Patients receive an intervention if medication is not taken and escalates to medical staff with detailed utilization data. Our aim of this pilot program was to engage HCV treatment patients with a new tool for adherence and to optimize Nomi performance in our clinical environment.

Methods: 25 patients with hepatitis C with access to a mobile phone treated with sofosbuvir containing single tablet regimens from June 2017-July 2018 participated in the program. Patients were categorized to have sufficient data for analysis if >60% of available days of monitoring data and defined as engaged with Nomi if >90% of monitored days had interactive messaging enabled. A conversion was defined as medication administration following Nomi intervention.

Results: 18 patients (72%) had sufficient monitoring data for analysis. 7 patients had insufficient data due to technical hardware issues or insurance problems with medication refills. Overall, the population received 184 missed dose interventions leading to 109 dose

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conversions. 13 of 18 sufficient data patients were engaged with >90% available time with interactive messaging activated. 6 of 13 sufficient engagement patients were high intervention (HI) (>7 interventions per subject, median:18.5; IQR:16) vs. those with low intervention (LI) (<=7 interventions per subject, median:2; IQR:4), (p=0.001). The median number of converted doses was significantly higher in the HI group at 13 (IQR:7) vs. 1 (IQR:2) in the LI group (p=0.001). Median Nomi impact rates of patient adherence were significantly higher at 23.2% (IQR:15.2%) amongst the HI group vs. 1.3% (IQR:3.6%) of the LI group (p=0.001). Age and gender were similar between groups (p=0.181 and p=0.657, respectively). The SVR rate for the cohort was 100% for those with available data (16/18 patients).

Conclusion: Personalized interventions, based on real-time data from the Nomi system, can assist with patient adherence and missed dose conversions to potentially maximize HCV SVR rates. Patients with a higher intervention rate corresponded with a greater improvement in overall adherence. Further study is required to define the optimal role for Nomi in the hepatitis C treatment population.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 20-T

Poster Title: Implementation of telehealth in ambulatory care clinical pharmacy services within a large health system

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Purpose: Ambulatory care pharmacists practice under collaborative drug therapy management (CDTM) agreements at Yale New Haven Health. Patients often have difficulty attending in-person office visits due to financial constraints, lack of transportation, or lack of travel time. The 2019 ADA Standards of Medical Care in Diabetes support the use of telemedicine. Studies demonstrate that telehealth pharmacy programs can improve clinical outcomes. However, there are few published studies based in urban settings. This initiative was designed to implement telehealth video visits with ambulatory clinical pharmacists in urban and suburban settings, and to assess patient satisfaction of pharmacy telehealth visits.

Methods: A background literature review of programs that have implemented outpatient telehealth video visits was performed. Our pharmacists worked closely with the telehealth taskforce at our institution to ensure our electronic medical record features supported this type of visit and regulatory and compliance standards were met. Stakeholders, including our pharmacy leadership, system clinical ambulatory committee, and front line pharmacists were involved in the development of pharmacy telehealth services. Video visit training was conducted by the telehealth taskforce prior to implementation. In order to participate in video visits, patients were required to be located within the state of Connecticut during the time of the visit, be able to communicate in English, and have a compatible electronic device with access to their electronic medical record via a designated phone or web application. Patients

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were presented the option of a video visit as an alternative to a clinic follow-up visit. A flowsheet was built within the electronic medical record to track and document patient acceptance and potential barriers to the adoption of telehealth services. Primary outcomes included the number of clinics where pharmacy telehealth services are offered and the number of completed pharmacy telehealth visits. Secondary outcomes included patient satisfaction, time or money saved for the patient, and influence on no-show rate.

Results: Telehealth visits have been implemented in our solid organ transplant clinic and in two of our accountable care organization primary care offices. Five full-time clinical pharmacists, two PGY-2 ambulatory care pharmacy residents, and one PGY-2 solid organ transplant pharmacy resident were successfully trained to complete telehealth visits. Telehealth video visits are used for any CDTM or medication adherence visit that requires the pharmacist to see a patient's home, their injection technique, medication bottles, or when there is an issue with patient access to an in-person office visit. Patients have the option to see pharmacists for in-person, telephonic, or video visits for follow-up appointments for chronic disease management. Participating patients reported time savings, cost savings, and would recommend video visits to other patients. Patients reported improved satisfaction with less time away from work, ranging from a few hours saved to not having to take an entire personal day for an office visit. The most common reason for declining was that patients preferred in-person visits when possible. Some of the barriers identified have been the need for interpreter services and the lack of patients who have access to their electronic medical record via the required phone or web application.

Conclusion: Successful implementation of telehealth services in three ambulatory clinics has been helpful in the expansion of our clinical ambulatory care pharmacy services. It has helped improve patient access to care and provided opportunities for patients to save money on transportation costs and missed hours of work. This initiative supports the utility of pharmacist led video visits in urban and suburban clinics within a large health system. Further evaluation is warranted to determine the effect of these services on clinical outcomes and the potential to expand to additional clinic sites.

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Submission Category: Ambulatory Care

Poster Type: Evaluative Study

Session-Board Number: 21-T

Poster Title: Quality performance implications of integrating a pharmacist into an accountable care organization-based primary care clinic

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Purpose: Accountable Care Organizations (ACOs) are networks of doctors, hospitals, and other healthcare providers, which share responsibility to coordinate high quality care across a specific patient population. When an ACO succeeds in delivering high quality care while decreasing total cost of care, it shares the savings for the Medicare program. Currently, the integration strategy of pharmacist driven-medication optimization within an ACO mainly consisting of primary care providers remains unknown. The purpose of this study is to evaluate the clinical and quality impact of pharmacist-driven medication optimization in an ACO-based primary care clinic.

Methods: This prospective, Investigational Review Board approved study, included Triad HealthCare Network (THN) Next Generation ACO or Medicare Advantage plan patients with a primary care provider at one family medicine clinic. The study intervention consisted of pharmacist review of clinic patients with unmet metrics for Group Practice Reporting Option (GPRO) and Healthcare Effectiveness Data and Information Set (HEDIS) ACO quality performance metrics. From October 30, 2017 to March 11, 2019, a pharmacist provided support in clinic for one day per week. Upon review, the pharmacist provided medication monitoring and pharmacotherapy optimization interventions. Pharmacist quality metric interventions focused on preventative health and disease management for populations including diabetes and hypertension. The majority of interventions were made pursuant to

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physician referral via a collaborative practice agreement. The primary outcome was the overall quality metric completion rate for pharmacist-driven interventions.

Results: At baseline, 516 Next Generation ACO and 721 Medicare Advantage plan patients met inclusion criteria with 1790 GPRO and 277 HEDIS unmet quality metrics, respectively. Average unmet quality metrics were 3.48 per patient for Next Generation ACO and 0.46 per patient for Medicare Advantage plans. A total of 121 unique patients were seen over 63 clinic days by the pharmacist for preventative health and disease management intervention. A total of 70 patients had A1C greater than 8 percent and 36 patients had A1C greater than 9 percent upon referral. Following pharmacist intervention, 33 percent of patients with A1C greater than 8 percent and 33 percent of patients with A1C greater than 9 percent met the quality metric at first follow-up A1C. The average A1C at referral was 9.07 percent, which was decreased to 7.85 percent at the first follow up A1C. Of 70 total patients assessed for hypertension, 40 patients (55 percent) had blood pressure greater than 140/90 millimeters of mercury during at least one pharmacist clinic visit. As of the last encounter with the pharmacist, 33 percent of patients achieved the blood pressure quality metric.

Conclusion: This prospective evaluation of clinical and quality impact within an ACO-based primary care clinic showed that pharmacist-driven interventions were helpful in identifying and correcting unmet quality metrics. ACOs should consider the integration of pharmacists into primary care settings to contribute to overall quality, thereby improving patient care and decreasing overall cost.

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Submission Category: Ambulatory Care

Poster Type: Descriptive Report

Session-Board Number: 22-T

Poster Title: Standardization of transitions of care pharmacy education for COPD patients

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Purpose: Medication errors during poor care transitions can lead to worse patient outcomes, including adverse drug events, fragmented understanding of medications, and hospital readmissions. Pharmacists assisting in transitions of care (TOC) can improve outcomes through education and other interventions. However, the optimal design of standardized pharmacist-led patient education remains unclear. We know particularly little about the optimal design for important subgroups of patients who are at high risk of 30-day readmission and take complicated medication regimens, specifically chronic obstructive pulmonary disease (COPD). We examined our current TOC pharmacy education, implemented improvements to our model through standardization, and assessed 30-day readmission rates.

Methods: After reviewing our current TOC pharmacy program and in collaboration with respiratory therapy, doctors, and TOC pharmacists, the following needs were determined for establishing a standardized program. First, there were not educational handouts for all inhaler devices that were easily readable and offered in both English and Spanish. Videos for when patients returned home from the hospital were also unavailable. Second, our TOC pharmacists frequently recommended a spacer prescription be sent to the pharmacy for patients upon discharge. However, due to lack of coverage by insurance and high cost, spacers were often not obtained after discharge. Third, our current practice utilizes the MEDCOINS score to determine patients at highest risk for readmission and would benefit from telephonic follow-up. The MEDCOINS score was not developed for a specific disease state and given the complexity and

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high readmission rates for COPD patients, it was determined that all COPD patients should receive telephonic follow-up within 1 week after discharge.

Results: A standardized TOC pharmacy education for COPD was implemented on November 1, 2018 at our institution. The program includes medication review, patient education, and follow-up phone call within 7 days of discharge. The review centers on medication appropriateness, including dose, directions, therapeutic duplication or omission, drug-drug interactions, and adherence. Patient education emphasizes medication dose and directions, appropriate administration incorporating teach back methods, and side effects. It is provided verbally and through a one-page, pictorial handout that was developed for each inhaler device currently on the market and a handout with video links to each device. Patients were provided spacers to aid in appropriate drug delivery, if indicated. A follow-up phone call includes medication reconciliation, and communication of identified discrepancies to patient's primary care provider. Since implementation, 31 patients received inpatient TOC pharmacy education. All but three of these patients received a spacer. To date, all follow-up phone call patients have not been readmitted within 30 days ($n = 11$). TOC pharmacists thus have a structure for the patient education services that they provide to each patient, which coincides with education provided by respiratory therapy. Our pharmacists have provided over 90 interventions to patients and providers.

Conclusion: Due to lack of guidance regarding COPD education, specifically by TOC pharmacists, our standardization of COPD education has received positive feedback from patients, pharmacists, and other providers. Lower readmissions for COPD or related conditions have been seen in patients who received TOC pharmacist education. This model is currently being adopted at another hospital in our health-system and can be replicated elsewhere. Given the limited resources allotted to TOC pharmacist services, we are conducting further research to determine if the MEDCOINS score can identify patients with COPD at highest risk for readmission to prioritize inpatient counseling and telephonic follow up.

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Submission Category: Clinical Services Management

Poster Type: Evaluative Study

Session-Board Number: 23-T

Poster Title: Pharmacist prescribing: a cross-sectional survey of the views of pharmacists in Saudi Arabia

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Purpose: Extension of prescriptive authority to professional groups other than the medical profession such as pharmacists, nurses and allied health professions has been implemented and evolved differently in different countries. Around twenty countries out of 193 member states of the World Health Organization (WHO) provide legal authority to non-medical professionals including pharmacists to prescribe medicines at a certain level and others are considering introducing legalization. In Some hospitals in Saudi Arabia, several qualified clinical pharmacists perform prescribing activities such as those run anticoagulation clinics. Yet, no legislation is available to support or govern this practice.

Methods: This cross-sectional survey study aimed to explore the views of pharmacists in Saudi Arabia (SA) on the extension of prescribing authority to them and determine their willingness to be prescribers and to identify the potential facilitators and barriers to introducing pharmacist prescribing. The proposal of this research has granted ethical approval from Jazan Hospital IRB (H-10-Z-068/1802). The survey targeted to share the opinion of registered pharmacists in Saudi Arabia. The questionnaire was adopted from a validated work used in a recently published study. Three email rounds were distributed to the registered pharmacist in the email group of Saudi Pharmaceutical Society. In addition to that, the link to the survey was also sent to saudiregistered pharmacist through WhatsApp's group related to Pharmacists in Saudi Arabia many time for the purpose of increasing the response rate.

Results: A total of 206 survey respondents have completed the questionnaire. Majority of the respondents were male (72%) and in the young age group (75.25% less than 40 years old). Two

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third pursued postgraduate studies, (50% related to clinical pharmacy). There was positive views of Saudi pharmacists to prescribing authority. More than 86% and 83% respectively believed that pharmacist prescribing would improve patients access to healthcare and to medicines. Seventy eight percent perceived that such prescribing right will minimize the illegal dispensing of prescription-only medicine, 82% expected that prescribing authority will enable better use of pharmacists professional skills and 75% agreed that Saudi pharmacists should be given the right to prescribe. Majority of participants (87%) expressed a strong desire to be prescribers if pharmacist are to be granted prescribing rights. In fact, 63% declared that they have a role in drug prescribing decision making process during their clinical practice and 29% practiced some form of prescribing privilege.

Factors believed to be a barrier were the following: expected resistance to pharmacist prescribing by the medical professionals, pharmacists lack access to patients' clinical data, shortage of pharmacists in the country to engage in additional roles, and lack of confidence to take such roles.

Conclusion: Many countries are moving forward toward non-medical prescribing (NMP), which contributed to improve patients access to healthcare services and medicine. There is favorable evidence on the impact of NMP on clinical outcomes of chronic disease at least in a level not inferior to that of doctors. Policy makers of health affairs in Saudi Arabia should consider the impact of such global movement to advance pharmacy practice in the country.

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Submission Category: Clinical Services Management

Poster Type: Evaluative Study

Session-Board Number: 24-T

Poster Title: Will the incorporation of rapid diagnostic tests with pharmacist involvement improve time to antimicrobial therapy for gram positive bacteremia and candidemia in two community hospitals?

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Purpose: The increasing use of technology to rapidly identify an infectious organism can assist clinicians in providing faster and effective therapy for bloodstream infections. However, even with rapid testing tools, prompt clinical response is needed to translate the results into appropriate actions. The purpose of this study was to determine if the introduction of real time pharmacists' response to positive rapid diagnostic tests would lead to a decrease in time to initiation of optimal and effective antimicrobial therapy for gram positive bacteremia and candidemia in a community hospital setting.

Methods: This was a quasi-experimental study conducted in two community hospitals. The study comprised of two cohorts of patients who were at least 18 years old and tested positive for gram positive bacteremia with *Staphylococcus aureus*, *Enterococcus faecalis*, *Enterococcus faecium* or *Candida* species. The pre-intervention cohort was admitted from November 2017 through May 2018. The intervention of real time pharmacists' intervention went live during the month of June 2018 at one community hospital and in July 2018 at the other community hospital. The intervention cohort was admitted from July 2018 through January 2019. Patients were excluded if they had mixed positive blood cultures within the same admission, died or transferred out prior to cultures becoming positive, or had received antibiotics before blood samples were taken. The primary outcomes were time to optimal therapy and time to effective

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therapy. Secondary outcomes included length of stay (LOS) in the hospital, inpatient mortality and clinical pharmacist interventions. Using an alpha value of 0.025, a power of 80 percent and a similar study as effect size reference, it was determined that a minimum of 48 patients would be needed to include in each group to power the primary outcome. Cox regression was used to investigate the effects of the intervention on the primary outcomes of time to optimal therapy and time to effective therapy.

Results: A total of 367 patients were identified with the inclusion criteria. After applying the exclusion criteria, 140 patients were included into the pre-intervention group and 124 patients in the intervention group for final analysis. Baseline demographics were well matched between the groups. The mean time to effective therapy decreased from 13.9 plus minus 21.6 hours in the pre-intervention group to 8.6 plus minus 12.5 hours in the intervention group (HR equal 1.15, 95 percent CI 0.89 to 1.48, p equal 0.29). The mean time to optimal therapy significantly decreased from 53.7 plus minus 57.7 hours in the pre-intervention group to 38.4 plus minus 31.5 hours in the intervention group (HR equal 1.73, 95 percent CI 1.33 to 2.26, p less than 0.001). The mean LOS for the pre-intervention group was 11.0 plus minus 7.2 days and 10.3 plus minus 5.4 days in the intervention group (p equal 0.96). Inpatient mortality rate was similar at about 5% for both groups (p equal 0.97). Clinical pharmacist made a total of 26 (18.6 percent) recommendations in the pre-intervention group, compared to 63 (50.8 percent) recommendations in the intervention group (OR equal 4.53, 95 percent CI 2.61 to 7.87, p less than 0.001).

Conclusion: The introduction of real time pharmacists' response to positive rapid diagnostic tests led to a significant decrease in time to initiation of optimal antimicrobial therapy but did not affect time to effective therapy. It also contributed to a significant increase in number of pharmacist recommendations made to the provider. The results showed that the allocation of limited manpower resources of a community hospital to such a stewardship program is justifiable and could encourage more community hospitals to follow suit in the future.

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Submission Category: Clinical Services Management

Poster Type: Evaluative Study

Session-Board Number: 25-T

Poster Title: Analysis of QTc monitoring best practice alert integrated into an electronic health record at a large academic medical center

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Purpose: Monitoring patients on QTc prolonging medications is important for the prevention of torsade de pointe, due to the associated mortality. A best practice alert was integrated into a hospital electronic health record to identify and to stratify patients into “Moderate” and “High” risk scores based on patient and medication risk factors. Once risk is calculated the pharmacists then evaluate the patients, recommend ordering electrocardiography (EKG), continue monitoring and follow- up through duration of QTc prolonging agents. The objective of this study is to assess QTc medication ordering practice post implementation of the QTc monitoring Best Practice Alert.

Methods: A retrospective chart review evaluating post- implementation of a QTc monitoring best practice alert at a large academic medical center. The study inclusion criteria included patients 18 years and older with a moderate or high risk for prolonged QTc interval as determined by the hospital guideline. The institution’s electronic health record was used to generate a report identifying patients that meet the BPA QTc interval monitoring alert and follow up action. The following de- identified data points were collected: patient age, gender, ethnicity, congenital cardiac risk factors, QTc risk factor score, and QTc medications ordered. The data collected was reviewed to assess ordering practices following guideline implementation, trend number of ordered QTc prolonging medications, assess overall reduction in high and moderate risk medications orders, average medication risks, stratification

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of most commonly ordered medication, reduction in patient QTc risk, and order discontinuation secondary to alert firing for prescriber.

Results: Data analyzed for review included March 2018 to December 2018 which is reflective of the guideline and best practice alert implementation. A total of 3796 medications were flagged as requiring monitoring throughout the time period with this impacting 1743 patients. An average of 168 patients per month were reviewed each month with each patient having an average of 2 medications with moderate or high QTc prolongation risk. The most commonly prescribed scheduled medications associated with the QTc monitoring were amiodarone, fluconazole, and ondansetron.

Conclusion: The implementation of QTc Monitoring guideline has standardized the monitoring of moderate and high risk patients, recommendations of ordering of alternative medications, and standardization of monitoring patients of moderate-high risk. Of note, ordering of verification of orders and EKG ordering for QTc prolonging risk has led to a standardized process that can quantify patient risk, alert providers for need to monitor and potentially order alternate therapy. This limited data review has led to modification of the current guideline and will involve a more in -depth review of prescribing patterns, EKG documentation, and a more stream lined end user process.

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Evaluative Study

Session-Board Number: 26-T

Poster Title: What size of tablets is optimal? Evaluations of ease of swallowing and handling

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Purpose: Tablets are the most widely used formulation of medication because they are convenient to carry, store, and handle. However, many patients report difficulties in swallowing large tablets. However, as tablet diameter decreases, patients have more difficulties in picking them up and handling them, especially elderly patients with functional problems in their fingers or poor eyesight. Thus, with respect to tablet size, there is a trade-off between ease of swallowing and ease of handling, and the optimal tablet size is unclear. We prepared tablets, ranging in size from 2–8 mm, and evaluated them for ease of swallowing and handling.

Methods: We prepared tablets of 7 different diameters (2, 3, 4, 5, 6, 7, and 8 mm) without any active pharmaceutical ingredients, and conducted trials to evaluate the ease of swallowing (swallowing trial) and the ease of handling (handling trial). All study volunteers provided written informed consent before participating, and the study protocol was approved by the Ethics Committee of the University of Shizuoka. In the swallowing trial, 17 healthy young volunteers (14 males, 3 females; mean age: 23.1 years) participated in a randomized crossover trial. The volunteers freely took each tablet with the minimum volume of water required to smoothly consume that tablet. The amount of water required to swallow the tablet was noted and a visual analogue scale (VAS, with most difficult being 100) was used to evaluate the ease of swallowing. In the handling trial, 25 elderly patients (14 males, 11 females; mean age: 80.4 years) participated. Each patient was asked to pick up 10 tablets, one by one, from a dish and

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place them in a medication cup placed 30 cm away from the dish. The total time taken to transfer all the tablets was measured. Finally, they were asked to evaluate the ease of handling the tablets using a VAS (with most difficult being 100).

Results: In the swallowing trial, the amount of water required to swallow tablets with diameters of 2 mm and 8 mm was 13.0 mL and 31.4 mL, respectively. VAS scores for ease of swallowing were also lower for tablets measuring 5 mm compared to tablets measuring 8 mm. For tablets 5 mm or less, VAS scores were nearly the same. For the tablet diameter range of 2–5 mm, the difference between the VAS values was 6.1, whereas for the tablet diameter range of 5–8 mm, it increased to 22.5. That is, the smaller the tablet, the higher the ease of swallowing. As for the handling trial, when the tablet diameter was increased from 2 mm to 4 mm, the time taken by the elderly patients to transfer all the tablets reduced from 34.7 seconds to 28.5 seconds; the VAS values also decreased from 59.7 to 38.2. For tablets measuring 5 mm or more, the time for handling and VAS scores were nearly the same regardless of size. Based on these findings, it was judged that a tablet diameter of 5 mm or more was acceptable from the viewpoint of handling.

Conclusion: Tablets with diameters smaller than 5 mm are considered easier to swallow, while tablets with diameters larger than 5 mm are considered easier to handle. This study suggests that there is a range of tablet diameters that satisfy both the ease of swallowing and handling, and that a 5 mm tablet is optimal for patients. Although this trial had some limitations (healthy adults in swallowing trial and race and ethnicity differences), we believe that these findings are useful for the development of tablets that could improve patient medication adherence in both Japan and the United States.

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Evaluative Study

Session-Board Number: 27-T

Poster Title: Pharmacokinetics and safety of different bupivacaine formulations and administration techniques in augmentation mammoplasty

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Purpose: Augmentation mammoplasty, a common cosmetic surgery, often includes the use of a local anesthetic such as bupivacaine HCl. Local anesthetics may cause serious complications known as local anesthetic systemic toxicity (LAST) when plasma concentrations are high. LAST is more common with unintentional intravascular injection or rapid systemic absorption from highly vascular areas. HTX-011 is a dual-acting, extended-release local anesthetic containing bupivacaine and low-dose meloxicam. Herein are a subset of results from two clinical studies utilizing bilateral submuscular augmentation mammoplasty, a highly vascular procedure, to report the pharmacokinetics (PK) and safety of bupivacaine HCl and HTX-011.

Methods: A phase 4 open-label study of bupivacaine HCl evaluated the PK and safety when administered via local infiltration methods of injection or instillation into the surgical site during bilateral submuscular augmentation mammoplasty. Subjects were randomly assigned 1:1 to 150 mg bupivacaine HCl via injection or 150 mg bupivacaine HCl via instillation. A phase 2b randomized study of HTX-011 included evaluation of the efficacy, safety, and PK of HTX-011 (400 mg/12 mg) administered into the surgical site without a needle during bilateral submuscular augmentation mammoplasty. PK parameters in both studies included maximum observed plasma concentration (C_{max}), area under the curve (AUC) from time 0 extrapolated to infinity (AUC_{0-∞}), time to maximum plasma concentration (T_{max}), and apparent terminal elimination half-life (t_{1/2}). Secondary endpoints included treatment-emergent adverse events (TEAEs) and rate of potential LAST symptoms.

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Results: In the phase 4 study 30 subjects received bupivacaine HCl (mean age, 30.5 years; BMI, 23.5 kg/m²; all female); 15 via injection and 15 via instillation. Mean (SD) bupivacaine C_{max} was 1110 (469) ng/mL for injection and 1110 (347) ng/mL for instillation (highest values of 2170 ng/mL and 1480 ng/mL, respectively). Mean (SD) AUC_{0-∞} was 8710 (2340) h·ng/mL for injection and 9850 (6760) h·ng/mL for instillation. Differences between injection and instillation for median T_{max} (0.73 vs 1.03 hours, respectively) and mean (SD) t_{1/2} (7.7 [2.3] vs 13.5 [5.0] hours, respectively) were not clinically significant. In the phase 2b study, 50 subjects received HTX-011 (mean age, 32.0 years; mean BMI, 24.1 kg/m²; all female). Among evaluable subjects for PK, mean (SD) bupivacaine C_{max} was 710 (246) ng/mL (highest value of 1550 ng/mL). Mean (SD) AUC_{0-∞} was 27,000 (8960) h·ng/mL, median T_{max} was 3.58 hours, and mean (SD) t_{1/2} was 19.0 (4.4) hours. No evidence of LAST was observed in either study.

Conclusion: The controlled release rate of bupivacaine in HTX-011 provided a lower mean C_{max} despite a higher dose of bupivacaine compared with bupivacaine HCl. No patients receiving HTX-011 had values above 2000 ng/mL where LAST has been reported to occur. Although LAST was not observed in either study, the risk of LAST may be lower for HTX-011 given the lower peak systemic exposure of bupivacaine and lack of injection. With the current focus on nonopioid postoperative pain management, a longer-acting, safe, and effective local anesthetic would provide a valuable addition to a multimodal analgesic regimen.

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Submission Category: Clinical Topics/Therapeutics

Poster Type: Evaluative Study

Session-Board Number: 28-T

Poster Title: Association of age and risk for tobramycin-induced nephrotoxicity in adults with cystic fibrosis

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Purpose: Cystic fibrosis (CF) is a genetic disease characterized by bronchiectasis and chronic recurrent lung infections in which *Pseudomonas aeruginosa* is a common pathogen. Tobramycin, an aminoglycoside antibiotic, is a common intravenous (IV) therapy used at higher doses for CF exacerbations. Nephrotoxicity is a significant side effect of tobramycin, for which tobramycin levels are monitored to prevent toxicity. As the lifespan of CF patients has increased over the past decade and a known risk factor for aminoglycoside-induced nephrotoxicity is decreased renal function due to age, the risk of tobramycin-induced nephrotoxicity in adult CF patients is not known

Methods: We conducted a retrospective observational study at a single Adult CF Program that cares for approximately 100 adult CF patients annually. All adult CF patients admitted from January 1st, 2014 to August 1st, 2018 who received high dose extended interval IV tobramycin were reviewed. Post-lung transplant patients were excluded. Institutional review board or ethics committee approval was not required by the institution. The primary outcome was nephrotoxicity defined as a rise in serum creatinine greater than 0.5 mg/dL, an elevated tobramycin minimum concentration (Cmin) greater than 0.5 mg/L, or an elevated tobramycin trough greater than 0.4 mg/L. Categorical and continuous data were analyzed using a two-tailed Fisher's exact test and an unpaired T-test, respectively.

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Results: There were 63 unique hospital admissions from 2014 to 2018, and 9 of those encounters met the definition for nephrotoxicity while receiving IV tobramycin. Baseline patient characteristics revealed no statistical difference in gender, days of tobramycin therapy, or concurrent use of vancomycin in those who developed nephrotoxicity compared to those who did not. The mean age of those who developed nephrotoxicity was significantly greater than those who did not (47 years of age vs 30 years of age, p-value less than 0.0001).

Conclusion: This single center study of adult CF patients treated with IV tobramycin for a pulmonary exacerbation showed that older age was associated with nephrotoxicity. This may have clinical significance as CF patients are living longer and therefore, further studies are necessary to determine if older patients may benefit from alternative tobramycin dosing regimens.

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Submission Category: Drug Information/Drug Use Evaluation

Poster Type: Evaluative Study

Session-Board Number: 29-T

Poster Title: Evaluation of antiemetic prophylaxis for patients with acute myeloid leukemia undergoing induction chemotherapy

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Purpose: Antiemetic prophylaxis for multi-day chemotherapy regimens remains a challenge due to overlap of acute and delayed nausea. The multiday regimen of seven days of continuous infusion cytarabine combined with three days of either idarubicin or daunorubicin (7 plus 3) is standard induction treatment for acute myeloid leukemia (AML). Previous studies have demonstrated an incidence rate of 5 to 17 percent of grade 3 nausea with 7 plus 3. Optimal antiemetic prophylaxis for 7 plus 3 is not established. We will evaluate serotonin antagonist monotherapy prophylaxis for AML induction chemotherapy and evaluate antiemetics used for breakthrough nausea to guide future practice.

Methods: We retrospectively identified patients with AML greater than or equal to 18 years old undergoing induction chemotherapy at Massachusetts General Hospital (MGH) during 2 time periods: period 1: ondansetron prophylaxis (OP) April 1, 2018 to August 31, 2018; and period 2: palonosetron prophylaxis (PP) October 1, 2017 to February 28, 2018. Ondansetron was administered as 16 milligrams daily for seven days and palonosetron was administered as 0.25 milligrams every 72 hours for two to three doses. The primary outcome was number of patients with complete response (CR) to antiemetic prophylaxis defined as patients with no emesis or rescue medications. Secondary outcomes included episodes of acute or delayed nausea, types and number of times antiemetics used for acute and delayed nausea, need for scheduled antiemetics, and characterization of scheduled antiemetics. Acute nausea was defined as breakthrough antiemetic use during chemotherapy up to 24 hours after the end of the

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cytarabine infusion. Delayed nausea was defined as antiemetics used from 24 hours after the end of the cytarabine infusion up to 168 hours (1 week).

Results: A total of 39 patients were screened with 13 included. Baseline demographics were similar between groups; however, one patient received fosaprepitant in the PP group. In the OP vs PP groups, results were as follows: CR to antiemetic prophylaxis in 3 out of 10 (30 percent) versus 1 out of 3 (33 percent). Acute nausea was experienced in 7 out of 10 (70 percent) versus 2 out of 3 (67 percent) patients. Delayed nausea was experienced in 5 out of 10 (50 percent) versus 2 out of 3 (67 percent). Time to breakthrough nausea was a mean of 36 hours (range of 12 to 91) and 33 hours (range 26 to 33 hours). Prochlorperazine and lorazepam were the most commonly used antiemetics in both the acute and delayed breakthrough nausea. Antiemetics for breakthrough nausea were only scheduled in 2 patients, all in the PP group and initiated during the acute phase of nausea. Olanzapine and prochlorperazine were the common antiemetics scheduled.

Conclusion: Out of 13 patients who received antiemetic prophylaxis with monotherapy serotonin antagonists for 7 plus 3, only 4 patients (31 percent) experienced a CR to antiemetic prophylaxis. Rates of acute and delayed nausea, and time to breakthrough nausea were similar to previous literature. This is the first report of multi-day palonosetron for 7 plus 3. This review suggests that 7+3 may require additional prophylactic antiemetics and scheduled antiemetics may increase CR rates. Future directions may include additional premedication antiemetics for 7+3, scheduling antiemetics earlier in chemotherapy course, and selecting antiemetics based on phase of breakthrough nausea.

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Submission Category: Drug Information/Drug Use Evaluation

Poster Type: Descriptive Report

Session-Board Number: 30-T

Poster Title: Systemwide formulary standardization: pilot of five ophthalmic medication classes

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Purpose: To reduce the number of medications used within a medication class and to maintain consistent medication formularies across a health system

Methods: Five ophthalmic classes (prostaglandin analogs, beta-blockers, carbonic anhydrase inhibitors, 1st-3rd generation fluoroquinolones, 4th generation fluoroquinolones) were assessed for standardization opportunities which included a clinical and economic assessment completed by the system-level drug policy team. Specifically, this included narrowing the number of agents used in each class to one or two medications and calculating associated cost savings. Clinical input was received from clinical experts and was based on existing therapeutic interchanges and preferred agents at the leading eye institute within the system. The Pharmacy Business and Contracting Committee provided input on the economic implications and validated cost saving calculations, while the drug use policy pharmacists and EHR specialists provided recommendations to facilitate implementation (e.g., decision support intervention in EHR, education for pharmacists). Clinical recommendations were approved by the system-level Pharmacy and Therapeutics Committee.

Results: Implementation of the formulary standardization pilot decreased the number of ophthalmic agents from fourteen to seven among the five ophthalmic classes evaluated. Assuming 100% adherence to the clinical recommendations, cost savings over one year are expected to be \$48K, based on wholesale acquisition cost.

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Conclusion: Reducing the number of medications available may reduce medication errors due to lack of familiarity with a wide range of products and has the potential to reduce cost. It also can decrease the amount of time and resources needed for EHR staff to maintain medication builds. At our health-system, further medication classes will systematically be assessed for standardization opportunities based on process outlined above. Modifications to process may be needed based on results of the pilot.

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Submission Category: Emergency Medicine

Poster Type: Descriptive Report

Session-Board Number: 31-T

Poster Title: Impact of the implementation of human trafficking training in emergency department and pharmacy school curriculum

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Purpose: During their time in captivity, up to 88% of HT victims seek medical attention with around 66% of these victims seek medical attention in an emergency department (ED). On top of this many HT victims pick up prescriptions for urinary tract infections, sexually transmitted infections, and emergency contraception at pharmacies. However, HT victims frequently go unnoticed by health care professionals in these settings due to lack of training on how to recognize and report the crime. The purpose of this poster is to demonstrate the impact that brief HT trainings can have in the ED and in pharmacy school curriculum.

Methods: A targeted literature review was conducted using MEDLINE, Embase, Cochrane Library databases in order to find the articles reported on HT. In order to find the articles, keywords for searching included "human trafficking", "recognition", "training", "education", "emergency department", "emergency ward" and "pharmacy". All studies were published in peer-reviewed academic journals between the years 2014-2017. Articles were included if they discussed the impact of a brief HT training can have in the ED as well as in pharmacy school curriculum. For supportive evidence, articles were included if they mentioned how grossly underrecognized HT is amongst health care professionals as a whole. Finally, the National Human Trafficking Hotline website was utilized for supportive evidence in the statistics on the number of HT victims in the United States annually. Articles were excluded if they were not primary literature, were published before 2014, focused specifically on nursing, or focused on addictions and mental health in HT victims.

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Results: More than 700 articles on HT have been published. After narrowing the search to articles that focused specifically on the ED and pharmacy curriculum, the total number of articles reduced to 51. Grace, et al. surveyed ED professionals on areas such as their current knowledge of HT recognition and knowledge on how to report the crime after the implementation of a HT training. The results of the study concluded that the HT training not only increased their knowledge of how to recognize and report HT but revealed that some of the professionals were confident they had encountered a HT victim prior to the training and did not report it. The results of Patel, et al. showed the drastic need for HT training incorporated into pharmacy school curriculum after administering a survey to pharmacy students proved the students were overwhelming uneducated on the demographics, warning signs, and medical conditions that HT victims could be treated for. The other studies had more results that supported that HT training implemented in an ED increased ED professional's awareness and identification of HT.

Conclusion: Approximately 97% of ED health care professionals do not go through a HT training in order to recognize the crime. ED health care professionals are in a unique position to recognize and report the crime of HT because of their high probability of encountering a HT victim. However, pharmacists are also at a high probability of encountering a HT victim because of their accessibility in both a clinic and community setting. A brief HT training in both an ED and pharmacy curriculum can prepare health care professionals that are likely to encounter HT victims to recognize and report the crime.

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Submission Category: Emergency Medicine

Poster Type: Evaluative Study

Session-Board Number: 32-T

Poster Title: Improving sepsis outcomes via pharmacy interventions and interdisciplinary education

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Purpose: Sepsis affects about 1-1.5 million patients annually in the United States, with an in-hospital mortality rate upwards of 30%. The Surviving Sepsis Campaign (SSC) guidelines provide recommendations for the care of patients with sepsis, including three- and six-hour bundles of care. A recent update from the SSC recommends that both bundles be complete within one hour of the patient's presentation. The purpose of this study is to evaluate the current adherence to pharmacy-related guideline recommendations and to assess the effect of the pharmacist's presence and education in the emergency department (ED) at a multi-hospital community health system.

Methods: This was a retrospective cohort study that was reviewed and approved by the Institutional Review Board. Patients were identified using the electronic medical record (EMR) and specific codes from the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10 codes). Patients who were at least 18 years of age and admitted with any sepsis, severe sepsis or septic shock ICD-10 code in November or December 2017 (prior to intervention) and in November or December 2018 (after intervention) were included, and the two groups were compared. Pharmacy presence in the ED began in late December 2017 in one of the five system-wide emergency departments. Education was provided in October 2018 via a formal PowerPoint-guided presentation (both live and via computer-based learning) to emergency department and critical care nursing staff. The primary outcome of this study was time to antibiotic administration. Secondary outcomes included percentage of time that SSC goals for administration of antibiotics were met, time to

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order entry, time to order verification, hospital length-of-stay, and in-hospital mortality. Analysis of primary and secondary outcomes utilized Student's t-test (or Mann-Whitney U test) and Chi-squared test (or Fisher's exact test) for continuous and categorical variables, respectively.

Results: Ninety-two patients were included in the pre-intervention group, while 124 patients were included in the post-intervention group. The median time to antibiotic administration in the pre-group was 2.93 hours, compared to 2.68 hours in the post-group (p equals 0.28). The number of patients receiving broad-spectrum antibiotics within three hours of presentation was 49 (53.3 percent) in the pre-group and 80 (64.5 percent) in the post-group (p equals 0.13). Median time to order verification was 4.5 minutes in the pre-group and 3 minutes in the post-group (p equals 0.57). The median hospital length of stay was 6 days in the pre-group compared to 2 days in the post-group (p equals 0.47). A pre-specified sub-group analysis was performed including patients admitted through the single emergency department that had pharmacist presence. In this sub-group, the median time to antibiotic administration was 3.0 hours prior to intervention, compared to 2.6 hours after pharmacist presence and nursing education (p equals 0.10). The number of patients who received antibiotics within three hours of presentation increased significantly from 21 (48.8 percent) to 43 (70.5 percent) after intervention (p equals 0.04). Time to order verification also decreased in this subgroup as well, though not statistically significantly.

Conclusion: The presence of a pharmacist in the emergency department increased the percentage of patients who received antibiotics within three hours per the Surviving Sepsis Campaign guideline recommendations. While other outcomes were not altered significantly, time to antibiotic administration, order verification and length of stay were numerically decreased after introducing pharmacist presence in the emergency department and providing interdisciplinary education to nursing staff. This evaluation provided evidence for inclusion of pharmacists in other emergency departments in the health-system and provided information regarding further improvements to be made to the medication use system to improve outcomes in patients with sepsis syndromes.

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Submission Category: Infectious Diseases/HIV

Poster Type: Evaluative Study

Session-Board Number: 33-T

Poster Title: Analysis of adverse drug reactions of first-line anti-tuberculosis drugs at a single institution in Korea

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Purpose: Tuberculosis is a major health and social problem globally, and Korea has a high incidence of tuberculosis among OECD countries. The high incidence of adverse drug reactions in the treatment of anti-tuberculosis drugs has become a major cause of difficulties in the treatment of tuberculosis with drug resistant mycobacteria. There is a need for evaluating incidence of side effects of anti-tuberculous drugs because there are ethnic differences in the adverse drug reactions and there is not enough data.

Methods: We retrospectively reviewed the medical records of all adult patients who were prescribed anti-tuberculous drugs at Seoul National University Hospital between 2011 and 2014 to determine whether there were any adverse events related to anti-tuberculosis drugs. The causality between drug and adverse events was assessed according to WHO-UMC causality criteria.

Results: A total of 2,618 patients were prescribed anti-tuberculous drugs during the study period, and 930 patients (35.5%) were found to have adverse drug reactions related to anti-tuberculosis drugs in 1,198 cases. The intensity of adverse drug reactions were mild, moderate and severe with 315 (10.9%), 774 (26.8%) and 109 (3.8%), respectively. The metabolic and nutritional disorders and liver and biliary system disorders were the most common in 204 and 103 cases, respectively. The most common signs and symptoms were 193 cases of hyperuricemia and 100 cases of hepatic enzymes increased. 413 cases (78.5%) of the adverse drug reactions appeared within 2 months from the start of medication. The most common

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cases in patients with severe cases were metabolic and nutritional disorders and musculo-skeletal system disorders, with 20 and 18 cases, respectively. The mean duration of treatment in patients with severe cases was 11.7 (\pm 5.2) months, 2 months longer than in those without any adverse reactions.

Conclusion: The incidence of adverse reactions to anti-tuberculous drugs in a single institution was high (35.5%). The adverse drug reactions appeared mainly within 2 months(78.5%). In particular, the incidence of severe adverse drug reactions was 3.8% and the mean duration of treatment was 11.7 (\pm 5.2) months, which is relatively longer than those without any adverse reactions, more careful management of adverse drug reactions in anti-tuberculosis therapy is needed.

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Submission Category: Infectious Diseases/HIV

Poster Type: Evaluative Study

Session-Board Number: 34-T

Poster Title: Evaluation of institutional vancomycin dosing nomogram compliance and outcomes in the neuroscience and medical intensive care units

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Purpose: Empiric vancomycin dosing in critically-ill patients continues to pose a challenge due to pharmacokinetic and pharmacodynamic alterations in this patient population. Institutions have implemented hospital-wide vancomycin dosing nomograms to help optimize efficacy and minimize toxicities. The purpose of this study was to evaluate whether a hospital-wide vancomycin dosing nomogram achieves similar outcomes in non-surgical critically-ill patients admitted to a neuroscience (NSICU) or medical intensive care unit (MICU), as well as to evaluate the laboratory and clinical outcomes associated with overall nomogram compliance.

Methods: A retrospective analysis was performed of patients admitted to the NSICU or MICU between November 1, 2017 - September 17, 2018 treated with vancomycin therapy. Patients were excluded if they received less than 72 hours of vancomycin, required renal replacement therapy, or had estimated creatinine clearance using the Cockcroft-Gault equation (CrCl, mL/min) less than 20 mL/min. Data were collected for prescribed vancomycin regimens, initial vancomycin trough (mcg/mL), time to reach first therapeutic trough, and CrCl at initiation and during vancomycin therapy up to 14 days. The primary outcomes evaluated are median initial trough levels and percentage of patients to reach a trough goal of 10-20. Secondary analyses were performed to assess differences in achieving therapeutic vancomycin trough levels of 10 – 20 mcg/mL at first check. Parameters affecting trough levels such as CrCl, age, gender, and

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weight were also analyzed between the NSICU and MICU. Statistical analyses were performed to assess the outcomes associated with nomogram compliance.

Results: Out of 989 patients screened, 191 (19.3%) patients met the inclusion criteria. Baseline demographics were similar between groups with a median age of 58 years (20-87) in NSICU and 61 years (24-43) in MICU. Median CrCl was 100 (28-278) in NSICU and 84 (20.1-380) in MICU, $p=0.043$. The median initial vancomycin troughs were 11.1 (4.6-28.9) in NSICU vs. 16.1 in MICU (3.8-30.4), $p<0.0001$. Nomogram compliance was 39% ($n=37$) in NICU vs. 28% ($n=27$) in MICU, $p=0.09$. Non-compliance stemmed primarily from a different loading dose (40%) and omission of a loading dose (28%); maintenance doses were given in accordance with the nomogram in 71% ($n=67$) of patients in the NSICU and 44% ($n=97$) in the MICU. For patients managed according to the nomogram, initial trough was 12.1 (5.5-18.2) in NSICU vs 14.4 (6.7-24.7) in MICU, $p=0.14$. In total, 84% and 74% of nomogram-compliant patients in the NSICU and MICU, respectively, achieved an initial trough of 10-20, $p=0.34$. However, the patients reaching a trough goal of 15-20 was lower in the NSICU group (19%) vs. the MICU group (37.5%), $p=0.006$. There were no notable differences in observed renal function from baseline to 14 days of therapy.

Conclusion: Compliance with the vancomycin dosing nomogram increased the likelihood of initial troughs at therapeutic goal in both the NSICU and MICU. Overall, NSICU patients achieved a lower initial trough vs. MICU patients, regardless of nomogram compliance. Furthermore, a lower proportion of NSICU patients achieved an initial trough goal of 15-20 vs. MICU in the nomogram-compliant group. In addition to improving vancomycin nomogram compliance and provider education, data will be used to develop dosing guidance for NSICU patients using AUC-based monitoring strategies given apparent need for higher dosing and level of monitoring.

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Submission Category: Infectious Diseases/HIV

Poster Type: Descriptive Report

Session-Board Number: 35-T

Poster Title: Analysis of vaccination errors reported to the Institute for Safe Medication Practices (ISMP) national vaccine errors reporting program (VERP)

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Purpose: Though immunization is one of the greatest public health achievements, continued success relies on the quality with which vaccines are prescribed, dispensed, stored and administered. To develop recommendations on ways to reduce vaccine errors and improve patient safety, this project was designed to provide a two-year analysis of vaccine errors voluntarily reported to the ISMP VERP.

Methods: Analysts queried the ISMP VERP database for events reported to ISMP from January 1, 2017 through December 31, 2018. The query yielded 1,143 vaccine error reports.

When submitting reports, reporters provided information in response to several questions, including event type, contributing factors, facility type, practice site, and practitioner type. For each question, the reporter had the option of selecting the “other” response to provide a free text answer. Reporters also completed a narrative field to provide more information about the event. Event narratives were further reviewed for common themes and contributing factors associated with the events reported.

Some vaccine errors were reported in clusters (i.e., the same error impacting multiple individuals at the same location). Each cluster report was considered as a single entry in the data analysis.

Results: The majority of reported errors reached the patient (87.8%, n = 1,008). Most of the reports were submitted by a practitioner working in the outpatient setting, including medical clinics (36.6%, n = 418), physician practices (24.4%, n = 279), ambulatory areas of hospitals

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(13.7%, n = 157), and public health immunization clinic (12.5%, n = 143). The error types reported most often included wrong vaccine (25.1%, n = 287), wrong patient age (17.4%, n = 199), and extra dose (10.7%, n = 122). A small number 1.4% (n = 16 of 1,143) of reports involved clusters of events. All clusters involved different types of errors with the largest number of individuals affected by wrong administration site and wrong dose-underdose errors (more than 100 patients per cluster).

Conclusion: Immunizations are one of the most effective disease prevention strategies. However, the effectiveness of vaccines depends on the effective handling and administration of the product. To reduce vaccination errors and improve patient safety, healthcare providers and manufacturers should adopt and layer multiple risk-reduction strategies to target identified system failures, including but not limited to staff and patient education; appropriate storage and handling of vaccines; and standardization of clinical workflow.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 36-T

Poster Title: An integrated approach to hospital controlled substances management using electronic medical record and automatic dispensing cabinet data

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Purpose: Many institutions utilize analytics packages and reporting tools to monitor controlled substance utilization and discrepancies. This initiative at the University of Virginia (UVA) Health System sought to establish regularly monitored metrics and standards for controlled substances management. To more comprehensively and accurately assess performance on these metrics, the pharmacy informatics team developed automated processes to integrate data from the electronic medical record (EMR) and automatic dispensing cabinets (ADCs). This study aimed to describe the integration initiative and identify baseline practice patterns and overall performance relative to institutional benchmarks regarding controlled substances management.

Methods: An interdepartmental team developed metrics and standards for controlled substance management including pharmacy administration, nursing administration, nursing education, anesthesia, pharmacy informatics, and EMR representation. Metrics were selected based on their ability to assess institutional performance surrounding controlled substance management and included: (1) Unreconciled dispenses; (2) Unreconciled discrepancies lasting over 24 hours; (3) Time from ADC retrieval to medication administration ("Time to Administration"); (4) Undocumented waste; and (5) Compliance with the institutional policy to complete ADC inventories daily ("Inventory Compliance").

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The EMR and ADC data integration was implemented on 9/20/18 in UVA's academic, tertiary 612-bed hospital. The integration was retroactively applied to available data beginning in 2017. Notably, integration of the EMR and ADC data enabled tracking of the Time to Administration metric, which was not previously available from ADC data alone. All metrics except the Time to Administration metric, for which a benchmark has not yet been established, are published on an institutional dashboard owned by an interdepartmental oversight committee to review on a monthly basis; previously, such metrics were seldom and inconsistently reviewed. For this study, descriptive statistics were used to retrospectively summarize institutional performance on the selected metrics during 2018, including range and mean (SD) monthly performance for continuous variables (Unreconciled dispenses, Unreconciled discrepancies > 24 hours, Undocumented waste, and Inventory compliance) or absolute frequencies and percentages for categorical variables (Time to Administration).

Results: The proportion of unresolved discrepancies that lasted > 24 hours ranged from 8.5-25.8%, with a monthly mean (SD) of 18.0% (5.39%). The mean (SD) number of monthly instances of undocumented waste was 133 (19.77) (range: 110-166). Both the proportion of discrepancies unresolved within 24 hours and undocumented waste were underperforming relative to benchmark goals of zero. The drugs most commonly associated with undocumented waste were fentanyl (29.2%), hydromorphone (15.9%), lorazepam (14.2%), and midazolam (12.3%). Undocumented waste was most common in the surgical intensive care unit (ICU) (13.7%), medical ICU (13.5%), and emergency department (10.2%). On average, 88.0% of the requisite daily inventories were conducted each month (SD: 3.62%, range: 82%-94%), just below the established benchmark of 90%. The vast majority (84.8%) of controlled substances were administered within 15 minutes of retrieval from the ADC; this proportion was consistent across months (83-86%). Fewer were administered 15-30 minutes (7.3%), 30-45 minutes (2.7%), 45-60 minutes (1.5%) or >60 minutes (3.8%) after ADC removal. The percent of monthly dispenses that were unreconciled ranged from 3.8-7.8%, for a mean (SD) of 6.6% (1.34%).

Conclusion: Successful integration of EMR and ADC data has enabled more accurate and consistent tracking of key metrics on controlled substances management. This provides the pharmacy IT team with greater flexibility to assess metrics not previously available, including time from ADC retrieval to administration. This analysis established baseline performance levels and facilitated comparison against benchmarks. In the future, performance may be assessed at the unit level to target interventions for quality improvement. Furthermore, impact of regular monitoring by the interdepartmental oversight committee and interventions to promote

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effective controlled substances management, may be assessed by comparing changes from these baseline performance levels.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 37-T

Poster Title: Evaluation of telepharmacy and the use of a gravimetric technology-assisted workflow system for remote sterile product pharmacist check

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Purpose: Telepharmacy has become an area of interest for many health systems seeking to expand medication access to patients in rural communities. Many states have not identified a role for telepharmacy in hospital pharmacies, specifically regarding compounded sterile products (CSPs), hindering the exploration of several opportunities, including workload sharing, optimization of technology, and the expansion of medication access to patients. The objective of this study is to evaluate the impact of remote sterile product pharmacist checks when used with a gravimetric technology-assisted workflow (TAWF) system on product checking accuracy, pharmacist review time, workload sharing, cost savings, and staff perceptions.

Methods: A multi-site, double-arm, prospective study design was built and implemented at four pharmacy locations for a period of 90 days. Each CSP that was checked by a remote pharmacist through the gravimetric-based TAWF system was also checked by a local pharmacist through the gravimetric-based TAWF system at the location where the physical CSP was prepared. An anonymous, online survey was emailed to pharmacist staff at each of the four pharmacy locations to evaluate respondent's perceptions of the accuracy, timeliness, and safety of the remote sterile product pharmacist check process as well as opinions on the potential impact and value of the process. The survey was distributed at two separate time points (pre- and post-implementation) to assess the change in their perceptions of the remote sterile product pharmacist check process. The survey questions at both distribution time points were identical. Error documentation, pharmacist review time, and workload sharing data were

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captured by the TAWF system. Cost savings data was obtained utilizing health system pricing information. Survey responses were collected utilizing an online survey tool. Accuracy data was compared using a Pearson Chi-Square test, and time data was compared using a Wilcoxon Signed Rank test. Descriptive statistics were utilized to analyze workload sharing, cost savings, and survey data.

Results: There was no statistically significant difference found between the number of errors detected through the remote sterile product pharmacist check process and the current process ($p=0.177$). Seventeen errors were found and documented by the remote pharmacist, and the local pharmacist agreed with 10 of these 17 errors. There were no errors documented by the local pharmacist that the remote pharmacist did not document. The median pharmacist review time in the remote sterile product pharmacist check process ($n=2603$) was 0.45 minutes compared to 0.18 minutes in the local sterile product pharmacist check process ($n=2577$) ($p<0.001$). The median queued duration time was 15.42 minutes ($n=2603$). Workload sharing was demonstrated during the study period, with 30.4% of the total CSPs verified by a remote pharmacist in the study workflow. The total amount spent on garb annually in the current, non-remote process was calculated to be \$23,770.08, compared to \$0.00 in the remote process. Percent agreement increased from pre- to post-implementation for survey questions about the safety of the remote check process, opportunity for workload sharing, and optimization of current workflow processes and decreased for questions inquiring about the accuracy, timeliness, and value of the remote process and its impact on job security.

Conclusion: This study demonstrated that when used with a gravimetric-based TAWF system, there is no difference in the accuracy and safety of sterile product pharmacist checks verified remotely versus checks performed in the same location as the physical product. In addition, the remote sterile product pharmacist check process allows for opportunities for workload sharing and cost savings. More structure in the workflow is needed to improve pharmacist perception of the remote process.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 38-T

Poster Title: Evaluation of two generations of automated dispensing cabinet (ADC) technologies: multi-site retrospective data analysis

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Purpose: This study aims to compare, describe, and benchmark key performance indicators (KPIs) between legacy and enterprise-level automated dispensing cabinets (ADCs).

Methods: A retrospective database analysis was conducted to evaluate key performance indicators (KPIs) between two generations of ADCs: legacy systems with single-facility management and enterprise-level technology. KPIs included average: stock out percent, pockets without vend for 90 days per station, and removed outdates. All dispensing records from the ADCs available for research were aggregated using de-identified data for January 2018 and June 2018. Researchers were blinded to any information related to hospital name, location, number of beds, and any transactional information. Using a point prevalence approach KPIs were analyzed using descriptive statistics and trends in MS Excel.

Results: This retrospective data analysis included 133 legacy hospitals and 164 enterprise-level hospitals.

Pockets that contain medications which are not routinely dispensed can create inefficiencies through expired waste and occupy ADC space that could be used for other critical medications, as well as bloated inventory cost. Average number of pockets without vend 90 days per station ranged from 1550 to 1564 for legacy and 1392 to 1505 for enterprise. The average number of pockets without vend per station was between 3.8-10.2% lower with enterprise-level ADC sites compared to legacy.

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Carrying too little inventory can create supply exhaustion (incidents of depleted stock at specific locations) that can cause delays in therapy and potentially lead to patient harm. Average stock out remained at 1.1% for legacy and 1% for enterprise. The average stock out percent was 9.1% lower with enterprise-level ADC sites compared to legacy..

On the other end of the spectrum, storing too much inventory can lead to expiration related waste. Average removed outdates per station ranged from 406 to 419 for legacy and 201 to 203 for enterprise. The average removed outdates per station was between 50.1-52.1% lower with enterprise-level ADC sites compared to legacy.

Conclusion: This retrospective database analysis demonstrates that newer enterprise-level ADC technology, which can centralize inventory management and standardize policy across a health-system with multiple locations, can potentially be used to drive reductions in stock outs and expired medication waste as well as optimize inventory storage. With continued rises in medication costs, medication inventory management is increasingly important. Big data can be leveraged to (1) help individual facilities optimize their technology (2) benchmark facilities across health-systems.

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Submission Category: Informatics/Technology/Automation

Poster Type: Evaluative Study

Session-Board Number: 39-T

Poster Title: Minimizing alert fatigue: Optimizing clinical decision support by reducing unnecessary medication alerts

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Purpose: Healthcare institutions increasingly rely on clinical decision support tools to aid in the prevention of adverse drug events. Despite their potential benefits, clinical decision support systems have also been recognized for producing excessive, unnecessary alerts. Irrelevant warnings contribute to diminished responsiveness to alerts, recognized as alert fatigue. When appropriately designed and applied, medication alerts can improve clinician workflow, improve patient care, and decrease healthcare costs. The purpose of this study is to minimize alert fatigue by reducing the total number of medication alerts that inpatient pharmacists are exposed to in a 325-bed community hospital.

Methods: This quasi-experimental study was approved by the institutional review board. Hospital pharmacists were surveyed to obtain information regarding their personal views of medication alert volume and management within the institution. Data was collected by running two medication alert reports in the electronic health record in two- to four-week increments and then was organized based on alert volume. Alerts determined to be of limited clinical value were submitted to the institution's Medication Management and Safety committee and the Clinical Decision Support committee for review. Alerts approved for adjustment were run in a testing environment prior to implementation within the live environment of the electronic health record. Data was gathered for a four-week period and assessed to determine if there was a reduction in the total number of medication-related alerts.

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Results: Twenty pharmacists completed the survey, a response rate of 45 percent. Regarding medication-alert volume, 45 percent of pharmacists viewed the volume of alerts seen on a daily basis during order verification as more than enough, and 40 percent of pharmacists reported feeling that the number of medication alerts was excessive. Duplicate therapy and drug-drug interactions were the most common alert types in the preintervention and intervention phases. Dosage adjustments were also adjusted based on results from the pharmacist survey. A total of seven alert categories were adjusted in phase one, and 27 alerts were adjusted in phase two. As a result, the number of alerts per day were reduced by 11.7 percent and the number of alerts per 100 orders were reduced by 12.5 percent.

Conclusion: This process for medication alert reduction exceeded the intended outcome of reducing alerts by 10 percent. This processes was effective for reducing the burden of clinician alert fatigue, leading to more efficient and useful support systems, resulting in more focused patient care.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 40-T

Poster Title: Addition of a pediatric hospital in the electronic health record of a multi-facility health system: lessons learned

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Purpose: The medication use process for pediatric patients is often mixed in with processes in the pharmacy department designed for adult patients. This project was designed to systematically review computerized physician order entry (CPOE) build from adult hospital for a pediatric hospital implementation.

Methods: In 2016 the large university hospital implemented an electronic health record. Their patient population for the university hospital is primarily adult over the age of 18. The electronic record from this hospital was used for the pediatric hospital electronic health record implementation two years later. A systematic review of medications built in the system for adult patients was undertaken to adopt the build for pediatric patients.

Results: The review included extracts from the electronic health record which provided over 11,000 line items. Each medication was reviewed for pediatric context, evaluating dosing, measurability and administration amounts. This resulted in over 1,000 changes including but not limited to new medication build, new concentrations of existing medications and new routes of administration for existing medications.

Conclusion: Evaluation of any formulary build specific for pediatrics is essential prior to implementation of electronic health record for accuracy and safety of medication orders.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 41-T

Poster Title: Implementation of an electronic chain of custody workflow in an academic medical center

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Purpose: Documentation surrounding controlled substances dispensed from inpatient pharmacy has historically been a paper process which uses multiple inventory records for different control schedules and dosage forms. Inventory records are utilized to document chain of custody, administration, and waste information. Administration and waste data are currently recorded electronically, leaving chain of custody as the remaining piece of information documented through a paper process. The goal of this project was to implement an electronic process to capture chain of custody handoffs within the electronic medical record (EMR) for patient-specific controlled substances dispensed from the inpatient pharmacy and eliminate paper inventory records.

Methods: Pharmacy operations and nursing leadership developed an electronic chain of custody workflow to implement on two pilot units. The electronic chain of custody process begins with a pharmacy technician documenting a controlled substance as 'Sent' in the EMR. 'Send' is a discrete action in the EMR that is also associated with a pre-defined set of send methods. The pharmacy technician documents a send method of 'Picked up at pharmacy window'. Next, the user 'Receiving' the controlled substance from inpatient pharmacy documents a dispense as 'Received' through a mobile application of the EMR and barcode verification. The controlled substance is then delivered to the floor and administered to the patient. Data from the 'Send' and 'Received' actions were analyzed. Compliance to the

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workflow was assessed by reviewing send and receive actions for each dispense to determine the number and rate of workflow deviations.

Results: The electronic chain of custody pilot took place over 11 weeks. During this time, 154 patient-specific controlled substances were dispensed from inpatient pharmacy to the pilot units using the electronic chain of custody workflow. Of the 154 dispenses, there were eight deviations from the outlined process equating to a 5.2% deviation rate. Five workflow deviations resulted from no recorded 'Send' action and three workflow deviations resulted from no recorded 'Receive' action.

Conclusion: Based on the 11-week pilot, the electronic chain of custody workflow was shown to be a viable option to replace paper documentation for patient-specific controlled substances dispensed from inpatient pharmacy. Further assessment and evaluation is needed in order to expand the electronic chain of custody process to all inpatient units. Engagement of pharmacy and nursing leadership to create a standardized chain of custody process is a key consideration to meet the technology and workflow needs for both nursing and pharmacy users.

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Submission Category: Informatics/Technology/Automation

Poster Type: Descriptive Report

Session-Board Number: 42-T

Poster Title: Implementation and optimization of robotics in the preparation of intravenous chemotherapy at a large academic medical center

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Purpose: Preparation of intravenous hazardous medications in the oncology setting is a high risk endeavor that represents a prime opportunity for automation. Advantages of intravenous robotic system implementation include reduced risk of exposure and incorporation of gravimetric analysis, which aligns with Institute of Safe Medication Practices recommendations. Intravenous robotics also can be used for batch compounding, creating efficiencies by enabling more products to be produced in a shorter time period. This evaluation describes the implementation experiences at a large academic medical center.

Methods: The oncology pharmacy services 100 inpatient oncology beds, in addition to three oncology infusion areas with 150 to 200 patients scheduled per day. Combined, the oncology pharmacy prepares 150 to 180 chemotherapy orders per day. Two intravenous robots were implemented in the oncology pharmacy on July 27, 2015. A drug library was constructed that initially included 44 medications. A pharmacy automation specialist was trained and dedicated to serving as a superuser for the two intravenous robots. Pharmacy technicians and pharmacists were also trained on workflows for the technology. Accuracy thresholds were set within 5 percent of the ordered dose. Any dose prepared that failed to meet this threshold was further evaluated by pharmacists. Doses greater than 10 percent were automatically rejected.

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Results: In the first full calendar year of 2016, the intravenous robots successfully prepared a total of 12,368 chemotherapy doses. From this initial figure, annual production has increased to 16,270 chemotherapy doses in 2017, and 17,820 chemotherapy doses in 2018. These increases represent a 31.5 percent and 9.5 percent annual production increase, respectively. In 2016, 197 (1.6 percent) of chemotherapy doses were rejected due to preparations that exceeded accuracy thresholds. Accuracy has increased with 0.2 percent and 0.06 percent of chemotherapy doses being rejected in 2017 and 2018, respectively. Since implementation on July 27, 2015, the two IV robots have produced 56,880 chemotherapy doses through February 28, 2019. Of these doses, the mean percent error was negative 1, indicating that the final dose prepared was 1 percent lower than the target dose, which is within the acceptable negative 5 percent to 5 percent threshold. The drug library has been expanded to include a total of 50 hazardous chemotherapy medications.

Conclusion: Robotic technology minimizes staff exposure to hazardous medications and introduces gravimetrics to improve accuracy of production. The large academic medical center had a successful experience implementing robotic technology for chemotherapy production. Utilization of the robots has increased steadily over time since implementation, both with number of doses prepared and unique medications added to the library. Preparations within the robot routinely met pre-established safety thresholds.

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Submission Category: Investigational Drugs

Poster Type: Evaluative Study

Session-Board Number: 43-T

Poster Title: Evaluation of the efficacy of antifungal agents in the treatment of drug resistant human melanoma

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Purpose: Our long-term goal is to reduce morbidity and mortality associated with melanoma. This research aims to establish the ability of TRPM2 inhibition to eradicate multidrug resistance melanoma cells. The multidrug resistance (MDR) phenotype allows cancer cells to display decreased sensitivity to chemotherapy. A well-characterized drug resistance gene in cancer is MDR1, which encodes for p-glycoprotein/ATP-binding cassette transporter. Lesser known are the roles of the multidrug resistance-associated protein 1 (MRP1) and lung resistance-related protein (LRP) in melanoma. We characterized the expression levels of these genes in melanoma cell lines derived from human patients and determined their susceptibility to novel antifungal treatments.

Methods: Cell culture of human metastatic melanoma cell lines SK-Mel-23, UKRV-Mel-2, -3, -4, and -5 was utilized. The human keratinocyte cell line, HaCat (ATCC), was used as control. All cell lines were analyzed by real time quantitative PCR (qPCR) and immunoblotting for expression of drug resistance genes. Next, cells were plated onto 24-well cell culture plates and treated with 5-50 μ M of the antifungal agents, econazole and clotrimazole, for 1-6 days. All cell counts were performed in triplicate and all experiments were performed at least three times. Statistical analyses were performed via one-way ANOVA.

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Results: MDR1 expression was observed in multiple human melanoma lines, while increased levels of MRP1 and LRP were observed in normal skin cells and melanoma lines. Treatment with the antifungal agents, clotrimazole and econazole, caused significant decreases in proliferation and increases in cell death in all MDR melanoma lines. No extensive cell death was induced in noncancerous human skin cells. These results indicated that antifungal treatment selectively induced cytotoxicity in drug-resistant melanoma lines.

Conclusion: This study demonstrated the differential expression levels of MDR1, MRP1, and LRP in melanoma and normal skin cell lines. Because all melanoma lines were susceptible to antifungal treatments, we conclude that antifungal treatments have in vitro efficacy toward drug-resistant human melanoma cells.

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Submission Category: Investigational Drugs

Poster Type: Descriptive Report

Session-Board Number: 44-T

Poster Title: Investigational oral selective estrogen receptor degraders in clinical development

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Purpose: The FDA-approved treatment strategy for estrogen receptor positive (ER+) breast cancer (BC) is based on inhibition of the ER signaling pathway by directly antagonizing the ER with selective estrogen receptor modulators (SERMs) and selective estrogen receptor degraders (SERDs). This therapeutic strategy is continually evolving. The purpose of this project is to identify investigational SERD agents in clinical development that have the potential to overcome some of the limitations of fulvestrant, the only currently FDA-approved medication in this class and assess the participation of Massachusetts General Hospital in their development.

Methods: A search was conducted in ClinicalTrials.gov using the key words “breast cancer”, “estrogen receptor positive”, “selective estrogen receptor degrader”. The results were manually analyzed to distinguish between SERM and SERD agents. A second search was conducted the PubMed-NCBI database using the identified SERD agents for information about their properties.

Results: Seven SERD agents in clinical development were identified. Each of them had a novel chemical structure different from that of fulvestrant. All of them were oral agents and had reported in vitro ER affinity higher than that of fulvestrant. The stage of their development ranged from Phase 1 to Phase 3 clinical trials. In addition to studies exploring the single agents’ effectiveness, combination therapeutic options with CDK 4/6 inhibitors are also being investigated. Currently, only one agent is Phase 3 clinical development and is being directly compared with fulvestrant. The Massachusetts General Hospital participates in the development of six of the new SERD agents and has enrolled patents in nine clinical trials.

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Conclusion: The development of a number of novel oral SERDs emphasizes the importance of the SERD therapeutic strategy for the treatment of ER+ BC. The results from ongoing clinical trials hold promise of increase the number of agents in this therapeutic class.

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Submission Category: Nutrition Support

Poster Type: Evaluative Study

Session-Board Number: 45-T

Poster Title: Multicenter prospective evaluation of parenteral nutrition preparation time, resource utilization, and costs for two parenteral nutrition delivery systems: three chamber bags versus hospital-compounded bags

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Purpose: Parenteral nutrition (PN) is a life-saving treatment that is associated with high costs and involves multiple steps and extensive use of medical resources. Preparation time and resource utilization can vary according to the type of PN delivery system. To our knowledge, the staff time and costs associated with the use of three chamber bags (3CB) in the U.S. have not been formally evaluated. The aim of the present study was to evaluate the PN preparation time and resource utilization required for 3CBs compared with hospital-compounded bags (HCB).

Methods: We conducted a prospective, observational study in three hospitals in the U.S. to evaluate pharmacy staff time and costs associated with the preparation of PN using 3CBs versus HCBs. IRB approved or exempt status was obtained at all study sites. The observation period included the time from PN order transcription to completion of the preparation process. PN was prepared by trained pharmacy personnel under strict aseptic conditions. Each task during the PN workflow (transcription, review, and validation of the prescription; preparation of PN; and disinfection of equipment) was timed and recorded by an independent observer. Cost evaluation included direct costs for PN products and medical supplies, equipment costs (laminar flow hood and automated compounding device), and labor costs for each task in the PN workflow. The 3CB used in the study was Kabiven (Fresenius Kabi USA, Lake Zurich, IL). Costs

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for PN products were based on wholesale acquisition costs and medical supplies were based on published wholesale prices. Equipment costs were calculated as annual cost of equipment divided by the annual number of PN prescriptions based on an estimated average of 10 PN prescriptions per day. Labor costs were calculated based on median wages for hospital pharmacists and pharmacy technicians reported by the U.S. Bureau of Labor Statistics and the mean time spent during each task in the PN workflow.

Results: A total of 136 PN prescriptions were prepared during the study (3CB, n=66; HCB, n=70). The mean (SD) total time required for transcription, review, validation, and preparation of PN was 5.5 (1.3) minutes for 3CBs compared with 14.3 (6.2) minutes for HCBs (mean difference, 8.8 minutes; $p<0.001$). Significantly less staff time was required for pharmacists (mean [SD], 4.3 [2.6] vs. 7.7 [6.8] minutes; $p<0.001$) and pharmacy technicians (1.2 [1.7] vs. 6.6 [3.6] minutes; $p<0.001$) for 3CBs compared with HCBs. Additionally, 3CBs required significantly less time than HCBs for all steps in the PN workflow except prescription review and validation. The difference in the time required for 3CBs and HCBs was 12 seconds (30 and 18 seconds, respectively). The mean total estimated cost per PN prescription was \$81.60 for 3CBs versus \$129.20 for HCBs (mean difference, \$47.60); 3CBs were associated with lower mean costs for each cost category, including PN products and medical supplies (\$76.00 vs. \$116.60), labor (\$4.80 vs. \$9.70; $p<0.001$), and equipment (\$0.42 vs. \$4.35). Statistical significance (p values) could not be calculated for the total estimated cost difference, mean costs for PN products, medical supplies, and equipment because the number of observations were too low.

Conclusion: In a multicenter, prospective, time and motion study evaluating PN delivery systems, 3CBs were associated with a 62% reduction in pharmacy staff time and workload and a predicted 37% reduction in costs compared with HCBs. These findings demonstrate that 3CBs offer a potentially important cost benefit compared with HCBs and therefore represent an economically beneficial treatment option for hospitalized patients who require PN therapy.

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Submission Category: Nutrition Support

Poster Type: Evaluative Study

Session-Board Number: 46-T

Poster Title: Cost benefit analysis of parenteral nutrition delivered via three chamber bags versus hospital-compounded bags

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Purpose: Parenteral nutrition (PN) is an invasive therapy that involves multiple preparation and administration steps and carries the associated risks of blood stream infections. Complications due to PN-related infection are associated with increased resource utilization and increased healthcare costs. Prior studies have shown that resource utilization and the risk of clinical complications vary according to the type of PN delivery system. The aim of the present study was to evaluate the cost benefit of commercially-available three chamber bags (3CB) compared with hospital compounded bags (HCB) in U.S. hospitals.

Methods: A decision tree model was developed to evaluate the cost benefit of 3CBs compared with HCBs in adult patients. The health economic evaluation was conducted from the perspective of U.S. hospitals. Clinical outcome in the model was bloodstream infection (BSI); costs included PN, medical supplies, pharmacy staff labor, equipment, and treatment costs related to BSI. Model inputs for BSI were based on data from two recent reviews of the Premier Healthcare Database (Magee et al. 2014 and Banko et al., 2019). Costs for labor, equipment, PN products, and medical supplies were based on the reported costs from a U.S. multicenter time and motion study. The cost of 3CBs was based on the wholesale acquisition cost for Kabiven (Fresenius Kabi USA, Lake Zurich, IL). Additional costs associated with the treatment of BSI were

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derived from a recent cost analysis based on data from a large U.S. healthcare database (Paoli et al. 2018). Cost was calculated as the total daily cost per patient.

Results: The model analyzed two scenarios with different assumptions for BSI incidence, the first scenario based on the incidence for hospitalized patients (incidence of BSI: 5.6% / 6.8% among patients receiving 3CB / HCB; Banko 2019) and the second for critically ill patients (incidence of BSI: 1.7% / 2.1% among patients receiving 3CB / HCB; Magee 2014). The model-derived estimate for the total daily cost per patient in scenario one was \$1,041.88 for 3CBs and \$1,265.14 for HCBs. The incremental cost per patient was \$223.26, with 1.2% of infections avoided. In scenario two, the total daily cost per patient was \$313.66 for 3CBs and \$381.61 for HCBs. Per patient, 3CBs provided savings of \$67.96 and avoided 0.365% of infections compared to HCBs.

Conclusion: A cost benefit analysis comparing 3CBs with HCBs demonstrated substantial cost advantages for 3CBs per patient and day. The cost advantage represents a conservative estimate, as costs related to differences in medication errors, sepsis or administration time would likely yield additional cost benefits. Patients may also benefit from the reduced burden of infections, less antibiotic exposure and risk of associated complications, and lower length of stay. 3CBs are associated with a significant reduction in BSIs and therefore present a higher benefit per patient than HCBs. Based on these results, 3CBs represent a valuable strategy for PN delivery compared with HCBs.

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Submission Category: Oncology/Hematology

Poster Type: Descriptive Report

Session-Board Number: 47-T

Poster Title: Evaluation of glucarpidase rescue for methotrexate toxicity following implementation of institutional guidance surrounding utilization

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Purpose: High-dose methotrexate is used in a variety of malignancies and carries risk for adverse events including myelosuppression, neurotoxicity, and renal dysfunction amongst others. Glucarpidase is used for the treatment of toxic plasma methotrexate concentrations in those patients with delayed drug clearance. Clinicians continue to debate the use of glucarpidase rescue for methotrexate toxicity due to a lack of national consensus guidelines, with each administration decided on a case-by case basis. This project aims to describe recent cases of glucarpidase use to identify current practices and associated patient outcomes to further support clinical decision-making strategies and to validate institutional guidance recommendations..

Methods: A retrospective chart review of the electronic health record was performed to identify all patients who had received glucarpidase following methotrexate administration from August 1, 2018 to December 31, 2018. Data collection included methotrexate dose and timing, serum creatinine, urine output, glucarpidase dosing and timing of administration, methotrexate serum concentrations, and other pertinent patient lab values and demographics.

Results: During the observed study period, four patients received glucarpidase in response to potential methotrexate toxicity. Each patient received methotrexate and subsequently had

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supratherapeutic (>1 micromol/l) serum concentrations at 24 hours following administration. Concurrently each patient developed acute kidney injury (AKI). Three patients received glucarpidase in response to methotrexate concentrations greater than 5 micromol/l at 48 hours following administration per institutional guidance. Patients included had a median methotrexate concentration of 18 micromol/l prior to glucarpidase administration. Following one dose of glucarpidase, median methotrexate levels fell to 6.15 micromol/l, indicative of a 41.4% median change from previously measured levels. Two patients received a second dose of glucarpidase in response to worsened renal function and urinary output, as well as persistently elevated methotrexate levels. Among those who received a second dose of glucarpidase, a 51.05% median decrease in methotrexate concentrations was observed. Regarding renal function, the median baseline serum creatinine of those included patients was 0.775 mg/dl. This rose to 1.57 mg/dl within 24 hours following receipt of methotrexate, demonstrating a median increase by 170.4%. The median serum creatinine maximum exhibited by patients was 2.585 mg/dl, with 2 patients having serum creatinine which had not returned to baseline at 30 days following methotrexate administration.

Conclusion: Amongst four patients who received methotrexate for hematologic malignancies, there was an observed increase in serum creatinine following administration. Glucarpidase was used appropriately based on provider judgement and clinical support tools including institutional guidance. Further studies exploring renal dysfunction and AKI rates amongst those patients who receive methotrexate but do not require glucarpidase should be performed in order to validate trends observed in this report. Overall, this report provides insight into monitoring and usage strategies at our institution that may encourage the need for improved clinician support in the form of national guidelines to better determine appropriate utilization for glucarpidase.

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Submission Category: Oncology/Hematology

Poster Type: Evaluative Study

Session-Board Number: 48-T

Poster Title: Outcomes comparison of atezolizumab, nivolumab, and pembrolizumab for metastatic non-small cell lung cancer (NSCLC) in Veterans previously treated with platinum-based chemotherapy

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Purpose: Lung cancer includes both NSCLC and small cell lung cancer (SCLC); NSCLC comprises 80-85% of cases and includes squamous cell, large cell, and adenocarcinoma subtypes. Atezolizumab, nivolumab, and pembrolizumab are immunotherapies directed against PD-L1 or PD-1 which share the common FDA indication of metastatic NSCLC with progression during or following treatment with platinum-based chemotherapy. The purpose of this VISN 21 evaluation is to compare clinical outcomes of these medications for Veterans with metastatic NSCLC treated subsequent to first-line chemotherapy. Primary outcomes include overall survival (OS) and median overall survival (mOS). Results are compared to those reported in clinical trials.

Methods: This is a retrospective data review of patients who have already received treatment. The project was reviewed by the Institutional Review Board and determined to be quality improvement. Data is extracted from VA corporate data warehouse using Microsoft SQL Server Management Studio. Lung cancer diagnosis is identified using ICD-9 and ICD-10 codes from outpatient and inpatient encounters. Inclusion criteria include patients with a diagnosis of metastatic (Stage 4) lung cancer who have received a platinum-based chemotherapy prior to or concurrent with treatment initiation of immunotherapy. Metastatic disease is identified through diagnosis codes or review of the electronic medical record. Exclusion criteria include

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small cell morphology, use of the immunotherapy as first line, and treatment with additional intravenous or oral oncology medications after the treatment end date of the immunotherapy. Cell morphology is identified using documented cytology or surgical pathology reports. Patients with unidentified morphology are included within the analysis. Patients receiving pemetrexed, bevacizumab, or paclitaxel as concomitant first-line therapy were excluded. Statistical analyses include Kaplan Meier survival curves. Survival is assessed in 30-day increments which begin at the start of treatment for each individual patient. Patients who have not to-date been treated for the specified duration being assessed have their unknown future outcomes removed from affecting the survival probability through censoring. Number of doses received and reasons for discontinuation are identified through chart review.

Results: Within VISN 21, 415 Veterans were treated with atezolizumab, nivolumab, or pembrolizumab from the time of FDA approval through start of analysis in November 2018. Of these, 196 patients were treated for lung cancer. None were identified with documented SCLC. Seventy-nine had prior or concurrent therapy with platinum-based chemotherapy, including carboplatin or cisplatin. One patient did not meet inclusion due to Stage 3 NSCLC. Thirty-seven patients were excluded—8 were excluded for concomitant therapies indicating first-line treatment regimen, 21 for further treatment with additional antineoplastics, and 8 patients met both criteria. The survival analysis included 41 patients. Of those, the mOS was 16, 8, and 7 months for atezolizumab (n = 9), nivolumab (n = 27), and pembrolizumab (n = 5), respectively. Confirmed NSCLC morphology subgroups (n = 31) demonstrated a mOS of 7, 7, and 4 months for atezolizumab (n = 8), nivolumab (n = 19), and pembrolizumab (n = 4). The average number of infusions received prior to discontinuation or death were 14 for atezolizumab (range: 1-44), 11 for nivolumab (range: 1-39), and 6 for pembrolizumab (range: 3-10). Two of five patients treated with pembrolizumab were noted upon chart review to have discontinued due to suspected drug-induced pneumonitis.

Conclusion: This VISN 21 evaluation observed that, for those with confirmed NSCLC, the mOS of each immunotherapy was observed to be shorter than in clinical trials. For the total cohort, atezolizumab demonstrated longer mOS. Information collected on doses received and reasons for discontinuation suggests that pembrolizumab may be less well-tolerated with increased incidence of documented drug-induced pneumonitis. Current findings are significantly limited by small numbers of patients meeting inclusion. Further review is warranted as additional patients continue to be treated with immunotherapy. Clinical outcomes associated with uses outside of the presently evaluated indication and place in therapy should also be investigated.

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Submission Category: Oncology/Hematology

Poster Type: Evaluative Study

Session-Board Number: 49-T

Poster Title: Evaluation of the efficacy and safety of apixaban and rivaroxaban in cancer patients receiving concomitant active anti-neoplastic therapy at an outpatient cancer setting

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Purpose: Venous thromboembolism is a common complication among cancer patients with an estimated risk of 20 percent. The causes are multifactorial and include prothrombogenic antineoplastic medications. According to the National Comprehensive Cancer Network guidelines, low molecular weight heparins are the recommended agents for treatment of venous thromboembolism in cancer patients. There is an unmet need regarding the impact of the drug interactions between direct oral anticoagulants and antineoplastic medications on the safety and efficacy of the anticoagulants. The purpose of this study is to evaluate the impact of the drug interactions on venous thromboembolism recurrence and bleeding events in cancer patients.

Methods: Institutional review board approved retrospective chart review of cancer patients in an outpatient setting concurrently receiving antineoplastic therapy and venous thromboembolism treatment with apixaban or rivaroxaban during the period of 09/01/2017-08/31/2018. Patients were identified and reviewed through the electronic health record system and hematology and oncology service line at 5 outpatient hospital clinic locations. Inclusion criteria consisted of cancer patients aged 18 years or older, diagnosis of cancer and received an active antineoplastic therapy, diagnosis of venous thromboembolism and receiving anticoagulation with apixaban or rivaroxaban, and treatment in one of the five Houston Methodist Hospital system outpatient clinic locations. Exclusion criteria consisted of patients

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receiving anticoagulation therapy for non-valvular atrial fibrillation or postoperative venous thromboprophylaxis and patients receiving anticoagulants other than apixaban and rivaroxaban. Drug interactions were identified using Lexicomp, Micromedex, and drug pharmacokinetic information. The impact of the drug interactions was determined based on the rate of venous thromboembolism recurrence and bleeding events in patients with drug interactions compared to that in patients without drug interactions. Descriptive statistics will be calculated and chi-square analysis will be conducted to compare groups.

Results: Preliminary data of 21 cancer patients charts have been reviewed. Of the 21 patients, 57.1 percent of drug interactions between the antineoplastic therapies and anticoagulation with either apixaban or rivaroxaban were observed. Patients with drug interactions compared to patients without drug interactions had venous thromboembolism recurrence of 25 percent versus 33 percent, and bleeding incidence rate of 50 percent versus 55 percent, respectively. Of note, drug interactions between apixaban or rivaroxaban and supportive care treatment medications have significant drug interactions with the anticoagulants which can explain the comparable percentage of the composite primary endpoint of venous thromboembolism and bleeding which was found to be 75 percent in patients with drug interactions versus 89 percent in patients without drug interactions.

Conclusion: Drug interactions between apixaban or rivaroxaban and antineoplastic therapies when administered concomitantly have an impact on the safety and efficacy of the anticoagulants as a treatment for venous thromboembolism in cancer patients. Larger sample size is required, and data analysis is currently ongoing to better evaluate the impact of these drug interactions. This study will help identify the most effective and safe combination of antineoplastic medications with apixaban or rivaroxaban in this patient population.

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Submission Category: Pain Management/Palliative Care

Poster Type: Descriptive Report

Session-Board Number: 50-T

Poster Title: Determining clinically important risk factors for an opioid stewardship clinical dashboard: a delphi consensus study

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Purpose: The opioid epidemic continues to result in significant morbidity and mortality even within hospitals where opioids are the second most common cause of adverse events. In response, regulatory agencies have developed prescribing guidelines and regulations surrounding opioid prescriptions. Opioid stewardship programs may be one model for hospitals to ensure safe, rational prescribing to produce optimal clinical benefit and mitigate preventable adverse outcomes. Mechanisms are needed to identify patients with risk factors for opioid-related adverse events. Recent literature has identified several risk factors with varying clinical importance.

Methods: The objective of this project was to establish expert consensus about risk factors to be included in a clinical dashboard to identify patients at risk of opioid-related adverse events. The project received a grant from the ASHP Foundation. A Delphi approach was used to generate consensus among a national group of experts. This consisted of a four-round online survey along with two teleconference meetings. The initial two rounds obtained consensus on which adverse events and risk factors should be included. In the third and fourth rounds, participants ranked the importance of each risk factor on a scale of 1 to 4 for the given adverse event.

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Results: Seventeen participants completed the first round, 15 completed the second round, 12 completed the third round and 12 participants completed the fourth round. Participants consisted of pharmacists, physicians, and a nurse practitioner. Overdose after discharge, inpatient respiratory depression, sedation, confusion, uncontrolled pain, constipation, and withdrawal adverse events all achieved consensus to be included in a dashboard. Each adverse event included a list of risk factors ranging from four to over 50 risk factors identified. The results also yielded a ranked list of risk factors of opioid-related adverse events.

Conclusion: Seven preventable opioid-related adverse events were identified through group consensus. Additionally, the study resulted in a list of risk factors, each with a score indicating the importance of the risk factor. These results may be incorporated into a clinical dashboard to screen patients at risk of opioid-related adverse events.

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Submission Category: Pain Management/Palliative Care

Poster Type: Descriptive Report

Session-Board Number: 51-T

Poster Title: Association of prescription opioid utilization and the risk of abuse among managed Medicaid patients

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Purpose: Medicaid patients comprise nearly 40 percent of the 1.7 million people who have a prescription (Rx) opioid addiction, highlighting the importance of focusing on this study population. This study examined the association of Rx opioid utilization and the risk of abuse in managed Medicaid patients.

Methods: Retrospective analysis was performed on claims data from managed Medicaid patients in the MORE® Registry, a database that include claims data from over 130 individual carriers. Over 40% of managed Medicaid population is represented in the database. Patients were included if they had at least one Rx claim for an immediate-release (IR) opioid between 9/1/2010 and 9/30/2016 and were continuously enrolled for at least 180 days before and after the index IR opioid Rx. Patients who received an IR Rx opioid during the pre-index period and patients with a medical claim associated with opioid abuse diagnosis in the pre-index period were excluded. Patients could have received extended-release (ER) opioids during the post-index period. Patients were assigned to study cohorts based on their exposure to IR and ER opioids during the post index period. The proportion of patients with at least one medical claim associated with opioid abuse diagnosis during the post-index period was assessed. Opioid abuse related hospitalization and emergency department (ED) visits during 6 months after index IR opioid Rx were compared between study cohorts. Results were adjusted using the CMS hierarchical condition categories score, calculated based on comorbidities before index IR opioid Rx.

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Results: Data from 1,940,535 patients were analyzed. 1,162,386 received only one IR opioid Rx. The proportion of patients with an opioid abuse diagnosis during the post-index period was higher for patients receiving two+ IR opioid Rxs (1.70 percent) compared to patients receiving one IR opioid Rx (0.54 percent) ($p < 0.0001$). Patients receiving one IR Rx had lower rates of opioid abuse-related hospitalization (0.11 vs 0.35 percent, $p < 0.0001$) and opioid abuse-related ED visit (0.13 vs 0.36 percent, $p < 0.0001$) than patients receiving two+ IR opioid Rxs. Among patients receiving two+ IR opioid Rxs, 10,397 also received an ER opioid Rx in the post-index period. The proportion of patients with an opioid abuse diagnosis was lower for patients who did not receive ER opioids (1.51 percent) versus those who received ADF ER (7.67 percent) and non-ADF ER opioids (9.81 percent) (both $p < 0.0001$ vs. no ER). Patients who did not receive ER opioids had lower rates of opioid-related hospitalizations (0.27 percent no ER vs. 1.55 percent ADF ER opioids and 2.47 percent non-ADF ER opioids; both $p < 0.0001$ vs. no ER) and opioid-related ED visits (0.33% no ER opioid vs 1.31 percent ADF ER and 1.63 percent non-ADF ER opioids; both $p < 0.0001$ vs. no ER).

Conclusion: Patients receiving more than one IR opioid Rx are at increased risk of opioid abuse, especially when accompanied by non-ADF ER opioids. Targeting intervention on patients at higher risk of abuse can provide an opportunity to reduce the economic burden of opioid abuse.

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Submission Category: Pain Management/Palliative Care

Poster Type: Evaluative Study

Session-Board Number: 52-T

Poster Title: Naloxone dispensing rates in a hospital-based community pharmacy: a retrospective study

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Purpose: In an effort to decrease deaths attributed to prescription opioid overdose, a healthcare system established a dedicated opioid workflow process which recommends naloxone education and dispensing for patients provided by a pharmacist. Although there is a local state protocol which allows pharmacists to dispense naloxone, it is unknown whether all patients filling opioid prescriptions outside of this healthcare system's pharmacies undergo a similar screening process to receive naloxone. This study examined whether patients filling prescriptions at pharmacies outside of the healthcare system are receiving similar standards of care, as demonstrated by the percentage of opioids dispensed with accompanying naloxone prescriptions.

Methods: A retrospective, multi-center, observational analysis was conducted between select healthcare system pharmacies compared to external pharmacies. Prescription claims data were collected over a 12-month period between January 1, 2018 and December 31, 2018 from a pharmacy benefit manager (PBM) for patients discharged from healthcare system hospitals with opioid prescriptions to compare how many patients were dispensed naloxone at internal pharmacies compared to external pharmacies. This data was collected based off of discharge prescription orders generated within the health system's electronic medical record. Additional data was collected from the dispensing software used at healthcare system's community pharmacies to validate the results of the prescription claims for patients filling their prescriptions internally. In order to meet inclusion criteria, patients had to be at least 18 years

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old, insured with pharmacy benefits from the participating PBM, and prescribed opioid prescription(s) upon discharge from participating hospital or same-day-surgery unit. Prescriptions could be filled at any pharmacy of the patients' choice as long as their insurance was billed. Patients were excluded from the study if they did not meet inclusion criteria or had a substance abuse disorder, as determined by a history of Suboxone use within the study time period.

Results: A total of 8,110 opioid prescriptions were dispensed to a total of 6,939 unique patients within the study time period. Of the total opioid prescriptions dispensed, those filled at health system pharmacies (n = 5,025), 1.73% were accompanied with naloxone and those filled at non-health system pharmacies (n = 3,085), 1.26% were accompanied with naloxone (P = 0.099). Further analyzing the data based on use of a collaborative practice agreement (CPA), the opioid prescriptions dispensed at health system pharmacies and at non-health system pharmacies were accompanied with naloxone at a rate of 1.23% and 0.42%, respectively (P = 0.000). Furthermore, of the patients who filled opioids at health system pharmacies (n = 4,678) compared with the patients who filled at non-health system pharmacies (n = 2,261), 1.84% and 0.80% received naloxone, respectively (P = 0.001). These results were also analyzed by CPA use and it was found that 1.30% of patients filling at health system pharmacies and 0.31% of patients filling at non-health system pharmacies received naloxone per pharmacist utilization of a CPA (P = 0.000).

Conclusion: Statistical significance was found between the rate of patients receiving naloxone with opioid prescriptions at health system pharmacies compared to non-health system pharmacies, with health system pharmacies dispensing a higher percentage of naloxone. Additionally, statistical significance was found with the utilization rate of a CPA to dispense naloxone by pharmacists was higher with health system pharmacies versus non-health system pharmacies in regard to both total patients served and total opioid prescriptions dispensed. Regardless of the significant outcome, the low rate of dispensing suggests opportunity for increased utilization of the naloxone CPA by pharmacists.

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Submission Category: Precepting/Preceptor Skills/Education and Training

Poster Type: Descriptive Report

Session-Board Number: 53-T

Poster Title: Building resilience in pharmacy students and residents

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Purpose: Health profession students are often faced with stressful workloads that can lead to depression and burnout. Recent literature provides evidence that pharmacy residents are experiencing high levels of stress and depressive symptoms. Resiliency is the ability to withstand life and work stressors without experiencing depression and/or burnout. Residency programs may consider implementing ways to help residents increase their resiliency. The literature was reviewed to identify methods to increase resilience by way of decreasing stress levels, depression and burnout.

Methods: A literature search was conducted using Embase and Medline with the terms resilience, healthcare and students or residents. The initial search produced 75 results. All 75 trials were examined for relevancy to the topic. Of the 75 articles, 7 were chosen for inclusion due to the fact that they were clinical trials or systematic reviews using interventions aimed at reducing stress, depression, and/or burnout.

Results: Though there is limited information on stress reduction, depression, and/or burnout in pharmacy students or residents, There are several studies examining techniques to address these issues in other healthcare professionals. The most common intervention used in the trials was mindfulness based stress reduction (MBSR). MBSR programs typically consisted of face to face sessions lasting from a few minutes to 2 hours weekly. Most programs ran from 2-8 weeks and often included a component of daily practice outside of face to face sessions. The recommended time to devote to daily practice ranged from 5-30 minutes. Many studies demonstrated that mindfulness training decreases stress, anxiety, depression and burnout. The most common tools used to measure the outcomes included the perceived stress scale (PSS),

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the depression and anxiety scale (DASS), the Maslach Burnout Inventory (MBI) and the Mindfulness, Attention and Awareness Scale (MAAS). One small study (n=57) measured the effect of mindfulness training on resilience however, the study failed to demonstrate a benefit, possibly because it was underpowered. Notably, many of these studies enrolled small numbers of patients and were short in duration.

Conclusion: A number of studies have demonstrated the benefit of mindfulness based stress reduction for healthcare professionals and students. Integration of this program into pharmacy school curricula and/ or residency programs may be an effective way to address stress, depression and burnout among pharmacy students and residents.

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Submission Category: Precepting/Preceptor Skills/Education and Training

Poster Type: Evaluative Study

Session-Board Number: 54-T

Poster Title: Evaluation of an intensive education program on the treatment of tobacco-use disorder for pharmacists: a randomized controlled trial

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Purpose: Tobacco use is one of the main causes of premature deaths and preventable diseases in Qatar. Pharmacists practicing in community pharmacy are the first port of call for smokers. However, pharmacists in Qatar are not actively involved in tobacco control and many have not received any education or training about smoking cessation. The aim of this randomized controlled trial (RCT) is to design, implement, and evaluate an intensive education program on tobacco-use treatment for pharmacists in Qatar. The study objectives are to assess the effectiveness of the program on pharmacists' knowledge, skills, attitudes and perceived self-efficacy toward tobacco cessation

Methods: The study is a prospective RCT comparing an intensive tobacco-related education program versus non-tobacco-related training on pharmacists' tobacco-use-related knowledge, skills, attitudes and perceived self-efficacy. Community pharmacists practicing in Qatar were eligible for participation in the study. A random sample of pharmacists was selected for participation. Consenting participants were randomly allocated to intervention or control groups. Participants in the intervention group received an intensive education program on treatment of tobacco-use disorder. A short didactic session on a non-tobacco-related topic was delivered to pharmacists in the control group. The pharmacists' tobacco cessation knowledge and skills were assessed using a designed multiple-choice-based evaluation instrument and OSCE (Objective Structured Clinical Examination (OSCE) respectively. The secondary study

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outcomes of post-intervention attitudes towards tobacco cessation and self-efficacy in tobacco-cessation interventions were assessed using a survey instrument. Data was analyzed using Statistical Package for Social Sciences version 24. Demographic and other pharmacist education and practice-related questions, along with baseline knowledge, attitudes, and perceived self-efficacy, were summarized using means and standard deviations for numeric variables and frequency distribution for categorical variables. Those were compared between the study groups and within each study group. The level of statistical significance was set at 5 percent. N:B: the data related to the OSCE assessment will not be presented in this abstract for word limit purposes

Results: Participants in the intervention group (n=58) achieved significantly higher total tobacco-related knowledge scores (mean=33 points) than those in the control group (n=37) (mean=24.5 points) with a p-value of <0.001. Post-intervention total knowledge scores were significantly higher than the baseline scores for participants who received intensive tobacco education with a mean difference of 6.6 points (p-value <0.001). Overall attitudes toward tobacco cessation and self-efficacy in tobacco cessation interventions were better in the group of pharmacists who received tobacco education compared to those who did not. For instance 43.4 percent of pharmacists in the intervention group “strongly agreed” that their counseling will increase a patient’s likelihood of quitting tobacco use compared to 14.7 percent in the control group (p-value=0.014). Also, 57.4 percent of pharmacists in tobacco education group reported “very good” ability to advice patients to quit smoking compared to 35.3 percent in the control group (p-value=0.028). Furthermore, 20.4 percent of pharmacists in the intervention group reported that they are “extremely confident” to use appropriate questions to ask patients when providing tobacco cessation counseling versus 5.9 percent in the control group (p-value=0.005).

Conclusion: This study is the first RCT conducted within Qatar and the Middle East that includes designing, implementing, and evaluating an intensive education program on tobacco-cessation treatment for pharmacists in Qatar. The findings of this study suggest that provision of an intensive educational program on the treatment of tobacco use disorders results in improved tobacco-related knowledge and self-efficacy in tobacco cessation interventions. Such educational programs are essential for community pharmacists since they are the first point of contact for the general population and should be actively involved in tobacco control.

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Submission Category: Precepting/Preceptor Skills/Education and Training

Poster Type: Descriptive Report

Session-Board Number: 55-T

Poster Title: Development of a non-traditional APPE student experience in technology and industry

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Purpose: The organization began receiving pharmacy students as part of their Advanced Pharmacy Practice Experiences (APPE) program in 2015. Initially we received a small number of students each academic year from a single School of Pharmacy, and the program was loosely defined. In 2018, a total of 8 APPE students from two Schools of Pharmacy matched with us for rotations. With this increase in the number of placed students, it was determined that a more well-structured program was needed. A redefined program was developed, with the introduction of technology to guide the student through their rotation.

Methods: The Site Coordinator developed a revised program for Advanced Pharmacy Practice Experiences (APPE) students, based on pre-assessments of the student's interests. Prior the commencement of the rotation, each student is required to complete an online assessment of skills and interests, which is used to tailor the experience. The survey includes questions on the students intended career path, reasons for choosing this rotation site, and an array of questions on their exposure to business and technology. Students rated themselves on their familiarity with the topic on a scale of 1 to 5, where one (1) represents "little or no exposure or familiarity", and five (5) represents "considerable exposure."

Throughout the rotation, students are directed to a SharePoint site for all core content and information. This includes general expectations, company policies, and assignments. A news post function allows the preceptor to share relevant news, articles and readings on a real-time basis.

The daily activities for the students include shadowing opportunities from all areas of the business, including sales, marketing, product development and project teams. Students

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participate in both internal and customer-facing meetings. Student projects typically include a research assignment, presentations, and a journal club assignment. A post-rotation survey is done in addition to an exit interview to learn more about how the program can be more effective, and to measure its impact on the individual student.

Results: The assessment period covered a portion of the academic year, and a total of six APPE students completed rotations with Swisslog during this interval. All students completed a pre-assessment survey at the start of the rotation as a requirement, and all received requests to complete a post-rotation survey. Responses were received for 5/6 of the eligible APPE students.

With the self-assessments of common IT skills and tools, the pre and post responses from students varied significantly. In many instances, the students' assessments indicated a decrease in their knowledge, which is unlikely. This is more reflective of the self-reporting challenges of this measurement tool.

In the areas of business acumen and industry skills, the students' responses were more as expected, with the largest gains reported in the areas of interfaces/integration, formulary management, and automation. Automation knowledge had the largest gains reported, with each student's rating increasing by two (2) points.

When asked if they would recommend this rotation to other students, the calculated Net Promoter Score was 80, with 4/5 as promoters and one passive respondent. Students were asked if the rotation had an impact on their career path, and 60% (3/5) reported that it had influenced them.

Conclusion: Pre-and Post assessment of student interests and capabilities has shown to be impactful in tailoring a non-traditional pharmacy practice experience for students, and an aid to continuous improvement. The assessment provides a general understanding of a student's comfort with topics, but since there is no quantitative assessment of their skills, no conclusions can be drawn from the pre-and post-comparisons on skill gains, however.

In addition, the use of technology to access learning material and assignments can assist a preceptor with the challenges of managing student activities.

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Submission Category: Professionalism and Career Development

Poster Type: Descriptive Report

Session-Board Number: 56-T

Poster Title: Impact of a “bootcamp series: preparing for residency success” on pharmacy students

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Purpose: Opportunities for postgraduate training have grown tremendously over the recent years however residency training and application procedures are not formally introduced in the academic curriculum. Pharmacy students are likely to initially overlook post graduate opportunities due to the lack of exposure and information. The Student Society of Health-System Pharmacy (SSHP) at St. John’s University College of Pharmacy and Health Sciences (SJU-CPHS) decided to host a two - part “Bootcamp Series: Preparing for Residency Success” and performed a study to evaluate whether such an event informed and promoted students on ASHP Midyear Clinical Meeting and residency preparation.

Methods: SSHP collaborated with current residents at Northwell Health System to host the two-part Residency Preparation Bootcamp Series: Preparing for Residency Success during the Fall 2018 Semester at SJU-CPHS. The first part of the series, “Preparing for Midyear & Applications” involved two PGY2 pharmacy residents and one PGY1 pharmacy resident who discussed how students should prepare for the residency application process and provided information on what to expect from the ASHP-Midyear Clinical Meeting (MCM). To help facilitate discussion, the event was presented in a panelist format and the students were given the opportunity to participate in a Question and Answer session (Q & A). The second part of the series, “CV Workshop” featured a clinical pharmacy coordinator from Northwell Health System who presented on the differences between a resume and CV, and the Dos and Don’ts of writing a CV. Students were also given the opportunity to email their CVs for review. The students received feedback from each reviewer. A pre and post survey was administered to evaluate and assess the impact of the Bootcamp Series. The surveys included “Select All That Apply”

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questions, a Likert scale questions with a range of 1-5 (1 being “Strongly Agree” to 5 being “Strongly Disagree”) as well as an additional comment and feedback short answer questions.

Results: Fifty pharmacy students attended the Bootcamp Series Part 1; 40 (80%) surveys were assessed. Prior to the event, 70% (28/40) participants did not feel knowledgeable about the ASHP-MCM and how to prepare for the Midyear Residency Showcase. In the post event evaluations, all but one of the participants expressed increased understanding in what is expected from the ASHP-MCM and 37/40 (92.5%) agreed or strongly agreed to understanding on how to prepare for the Midyear Residency showcase. In the final evaluation, 39/40 (97.5%) students felt the event provided new insight on residency with one student feeling neutral. Fifty-four students attended the Bootcamp Series Part 2; 47 (87%) surveys were completed and assessed. Prior to the event 29/47 (61.7%) participants agreed or strongly agreed that they understood the differences between CV and a resume, 24/47 (57.4%) understood the content that belongs in a CV, and 19/47 (40.4%) knew how to format a CV. After the event, 46/47 (97.8%) participants better understood the differences between CV and a resume and all participants agreed or strongly agreed that they knew how to format a CV. Overall, all the students (47/47) concluded that this was an informative event that should be held every year.

Conclusion: The upward trend in the post evaluation and the positive feedback indicates that the Bootcamp Series: Preparing for Residency Success was successful in educating pharmacy students on what residency and ASHP-MCM entails, help prepare for the rigorous application process, create an ideal CV from their existing experiences, and help become better candidates for post graduate opportunities. The evaluation of these events helped SSHP realize the importance of holding such informative events and providing pharmacy students with a platform to grow and better their skills.

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Submission Category: Professionalism and Career Development

Poster Type: Evaluative Study

Session-Board Number: 57-T

Poster Title: Pharmacy students selection of their pre-registration training providers: a mixed methods evaluation of the first national recruitment scheme in England and Wales

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Purpose: A centralized system for recruitment of all hospital and many community pharmacy training programs based in England and Wales, United Kingdom (UK) has been recently introduced. In the UK, pre-registration pharmacy training is mandatory after four years of pharmacy degree for professional registration. As part of the national recruitment, applicants submit a single application and select prospective training programs and employers. Applicants are allocated a place based on their performance in a national assessment. This evaluation aimed to explore patterns of selection of prospective training programs by applicants and identify factors influencing their decision making process.

Methods: This study involved: a) analysis of employer selection and ranking data made by the applicants from the 2017/18 recruitment cycle, and b) a survey and c) focus groups with applicants to identify factors that influenced selection of prospective training programs through an online survey and focus groups. Invitation to participate in survey and focus groups was sent to all eligible students across UK. Ethical approval was obtained from University of Birmingham, England, United Kingdom.

Results: Employer selection data from all applicants (n=2694) was available. The majority (86%) of applicants selected pre-registration programmes across both hospital and community pharmacy sectors. A total of 83.9% applicants ranked hospital pre-registration programmes as

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their first ranked preference compared to 16.1% applicants who ranked community pharmacy programmes. London was the most popular local area selected by approximately 4 in 5 applicants. Significant variations in selection patterns across gender groups, ethnic categories and Schools of Pharmacy were identified.

A total of 307 responses (RR 11%) from the survey was obtained. Long-term career aspirations for working in a particular sector was the factor rated most highly by the respondents in their decisions, followed by proximity to the respondent's permanent home or where they would like to live long-term. Through focus groups and analysis of open ended comments from the questionnaire, a total of nine potential factors were identified as being key to participant decisions. These included knowledge about the training programs gained through employers and perceived opportunity for skills development. Respondents identified the need for improved quality of information about training programs from employers, particularly the community pharmacy employers to inform their decision making.

Conclusion: A high affinity of pharmacy students for hospital pre-registration pharmacist training programs was identified. The clinical roles and career opportunities in community pharmacy needs to be promoted as there is a risk that community pharmacy training places may be seen as a 'left over' roles for less competitive candidates to uptake.

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Submission Category: Psychiatry/Neurology

Poster Type: Descriptive Report

Session-Board Number: 58-T

Poster Title: Rapid deployment of a specialty pharmacy care model in a new specialty disease state

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Purpose: In the United States, the direct and indirect costs of migraine are estimated to be more than \$20 billion annually, and a significant proportion of this cost is attributable to chronic migraine. Calcitonin gene-related peptide (CGRP) inhibitors are a new class of self-injected migraine medications, and the first approved medication for migraine prevention in over 50 years. Studies have thus far demonstrated a statistically significant decrease in days of migraine and severity. Recognizing the high demand, cost and unmet healthcare need in the specialty market, we deployed a specialty monitoring protocol to track outcomes in patients prescribed CGRP-inhibitors.

Methods: We developed a migraine specific pharmacy care model for patients suffering from chronic migraines, a disease state that many specialty pharmacies were not participating. We reviewed clinical trial data as well as manufacturer and society recommendations to develop our care model for patients. Patients prescribed any CGRP-inhibitor are tracked for a number of outcome related metrics such as migraine free days, economic burden of migraine such as days of school/work missed, and migraine severity. In addition to bench-marking our outcome data against relevant clinical trials, each unique patient will have an individualized care plan to educate prior to starting and ongoing assessments throughout the course of their treatment for migraines achieving <15 migraines per month.

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Results: Patients are initially onboarded and screened by a clinical pharmacist to assess appropriateness of drug therapy choice for individual patients. A baseline evaluation of the patient's history is conducted and baseline data is collected. Initial counseling is performed at this time, consisting of self-administered injection techniques as well as side effect management. Ongoing follow up evaluations assess drug tolerance, any dosage adjustments, and adherence management. The follow up interval is patient specific, based on individual risk factors, concerns and tolerance. Outcome data is collected at each follow up and compared to baseline. Any patient who is not adherent to therapy or is experiencing increased migraine frequency or severity is referred to their provider and assessed for any potential dose escalation recommendations. Since implementation, our clinical pharmacists have enrolled 126 patients and performed 201 clinical assessments including initial comprehensive drug education and ongoing follow-up care plans. From these patients engaged by pharmacists, 21 interventions were performed related to side effect management, dose modifications, drug safety and therapy appropriateness.

Conclusion: New specialty medication approvals in disease states where there were previously none represent a unique challenge to specialty pharmacies. It is estimated that over 75% of medications currently in research in development will carry a specialty classification, many of which are in novel therapeutic areas. Being able to rapidly develop a process for caring for these patients is important for specialty pharmacies in the future.

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Submission Category: Psychiatry/Neurology

Poster Type: Evaluative Study

Session-Board Number: 59-T

Poster Title: Estimated healthcare costs among privately insured patients diagnosed with major depressive disorder and suicide ideation or suicide attempt in the United States

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Purpose: Costs for patients diagnosed with major depressive disorder (MDD) and suicide ideation (SI) or suicide attempt (SA) are not well understood. This study described these costs and examined whether they differ by 1st event type (SA vs SI) and care setting.

Methods: Adults (18-64 years) with MDD diagnosed during the study period and with at least 1 diagnosis of SI or SA (the 1st defined the index date) were identified in a US database of privately insured employees and dependents (OptumHealth Care Solutions, Inc; 01/2007-03/2017). Patients with less than 12 months of data pre-index and/or with diagnosis codes indicating psychosis, schizophrenia, bipolar disorder, mania, or dementia were excluded. Costs were calculated per patient per month (PPPM) at months 1, 3 and 12 post-index. Indirect costs captured medically-related absenteeism (i.e., work days missed due to medical visits) and disability costs. Costs were compared by index event type and care setting using linear models adjusted for baseline characteristics; p-values were bootstrapped. Comparisons by index event setting excluded costs of the index event.

Results: Among 7,724 patients identified (77 percent SI and 23 percent SA), the index event care setting type was: 56 percent inpatient (IP), 41 percent emergency department (ED) and 4 percent outpatient (OP). Post-index, 97 percent, 89 percent and 58 percent had at least 1, 3 and 12 months of follow-up. Direct costs at 1 and 12 months were 9,141 dollars and 1,942

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dollars PPPM, respectively. SA vs SI patients had 5,121 dollars and 358 dollars higher direct costs PPPM at 1 and 12 months (all p-values less than 0.01). ED vs IP patients had 1,096 dollars higher direct costs PPPM at 1 month (p-value less than 0.001); costs at 12 months were similar between cohorts. OP vs IP patients had similar direct costs PPPM at 1 month, costs were 601 dollars PPPM lower at 12 months among OP (p-value less than 0.001). Overall, indirect costs post-index showed similar trends to those observed among direct healthcare costs.

Conclusion: Direct healthcare costs amounted to 9,141 dollars PPPM in the 1st month post-index. Higher direct costs in the 1st month after the index discharge for those first presenting to the ED vs IP suggests a potential opportunity to improve care pathways. Future work is needed to estimate the full burden among this population, including estimates that incorporate the burden of absenteeism and presenteeism.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 60-T

Poster Title: Assessment of automated dispensing cabinet (ADC) safety in a large pediatric tertiary care hospital

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Purpose: The introduction of ADCs provided an innovative and secure upgrade to the manually-driven, error-prone floor stock processes that preceded their use. Despite this, early observational studies demonstrated an uptick in errors with error reduction limited to improvements in timely medication administration. Since the introduction of mechanical and technological safety-related upgrades, little work has been done to characterize the overall safety of these devices; especially in settings serving vulnerable populations such as pediatric patients, who are inherently at higher risk for errors. As such, our objective was to characterize current risks and failure modes associated with ADC-use at a pediatric institution.

Methods: Compliance with published guidelines was determined by performing gap analysis of baseline workflows against the ISMP's 2019 Guidelines for the Safe use of Automated Dispensing Cabinets. Opportunity to improve compliance was rated as significant (50 percent or greater), minor (less than 50 percent), or none based on the percentage of guideline statements for each core process rated as partial or no compliance. Cabinet level inventory was analyzed for potential medication dispensing errors by quantifying medications with look-alike packaging stored in close proximity within unsecured bins or look-alike/sound-alike naming risks within the ADC "stocked drugs" pick list. The potential for medication administration errors was rated by quantifying medications requiring further manipulation by the nurse prior to administration. Voluntary medication event reporting data was reviewed to characterize errors associated with the use of ADCs. Additional risks were identified through the use of Failure Modes and Effects Analysis (FMEA) for the ADC stocking and ADC dispensing processes.

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Historical floor stock requests and timeliness of medication administration data were analyzed to determine medication needs not currently met through centralized pharmacy dispensing.

Results: Gap analysis revealed significant opportunities to improve compliance for 5 out of 9 core safety processes as described by ISMP's 2019 Guidelines for the Safe Use of Automated Dispensing Cabinets. Cabinet level inventory analysis demonstrated high counts of medications deemed risky for potential dispensing errors (range: 4 – 157 dosage forms per ADC) and/or administration errors (range: 2 – 129 dosage forms per ADC). This was largely driven by the storage of multiple strengths of the same medication to best meet the range of doses required by pediatric patients. Additionally, commercially available single-unit dosage forms often require nurse manipulation prior to administration to facilitate weight-based dosing. Voluntary medication event reporting data suggested four main areas of vulnerability, including checks at restocking, checks at dispensing, inventory management, and medication security. Review of historical floor stock requests and timely medication administration data did not point to any significant unmet dispensing needs across the institution. The combined results for the ADC stocking and dispensing FMEAs identified more than 150 unique failure modes with over 200 unique causes.

Conclusion: Our analysis revealed many opportunities to improve the safe use of ADCs within our institution. Many of the identified gaps were related to limitations of human and technological resources, however we also identified several risks that are unique to serving pediatric patients and would likely not be mitigated by additional and/or improved resources. The range of doses required and the lack of commercially available single-unit dosage forms severely limit the number of medications that can be stored with minimal risk. Next steps include assessing proposed mitigations for efficacy and reliability and testing mitigations via plan, do, study, act (PDSA) cycles.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 61-T

Poster Title: Implementation of an operational and safety huddle board in a pediatric pharmacy at a tertiary health-system: impact on medication error reporting

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Purpose: The use of huddles by high reliability organizations have been established as effective safety tools. The Institute for Healthcare Improvement has been a long standing advocate for the use of regular huddles in the healthcare setting to plan production and optimize team communication. In order to improve communication pertaining to operational workflow and encourage discussion about recent safety events, anticipated safety events, and encourage reporting of safety issues, a daily huddle board and huddle was implemented.

Methods: The pediatric pharmacy huddle board was designed by the medication safety pharmacist with input from the pharmacy's operational manager and continuous improvement specialist. The huddle board was vetted and received feedback from staff pharmacists and pharmacy technicians. The design of the board allows for flow of discussion during a once daily huddle. The components of the board include: start with a safety story, recount days since last external medication error left pharmacy, displays good catches by staff, review census and work load, report equipment issues, staffing issues, shortages, and supply issues. The huddle ends with announcements. Daily huddles take place around the board and are led by the first shift pharmacist. The huddle last less than 10 minutes. Overall the huddle board has received positive feedback and improved communication amongst staff. In order to see if there was an increase in reported medication safety events by pharmacy staff due to daily emphasis on medication safety at huddle, the medication event reporting system data was reviewed pre and post huddle board implementation.

Results: During the three months prior to the implementation of the pharmacy huddle board, pediatric pharmacy staff reported 22 medication related events in the health-system's

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voluntary safety error reporting system. In the three months after the huddle board was implemented, 56 medication related events were reported by pediatric pharmacy staff. Other factors that could have influence reporting were the use of a shorten near miss form that was released during the time of the huddle board implementation in the health-system's medication even reporting system.

Conclusion: An increase emphasis on medication safety at pharmacy huddles is important to facilitating awareness of risk and opportunities related to medication errors. Utilizing a huddle board to streamline communication about medication safety events, "good catches" or near miss events that didn't reach the patient, and highlighting potential safety concerns is effective. It also can impact the amount of medication events that are reported through voluntary reporting systems that will then further allow investigation and risk reduction strategies to be explored.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 62-T

Poster Title: Evaluation of utilization patterns from one billion infusions: retrospective study on smart pump safety and practice improvement indicators

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Purpose: Medication errors are broadly considered to be a significant source of preventable patient harm. Intravenous infusion safety, in particular, has been a key area of focus for clinician-driven continuous quality improvement initiatives. This study aims to provide a US-level snapshot of smart infusion pump utilization patterns, assess the clinical relevance of select performance indicators, and identify areas for future practice improvement.

Methods: Conducted a retrospective data analysis of one of the largest vendor-hosted infusion databases. De-identified infusion records from January 2014 through June 2018 were queried from a Hadoop data ecosystem. Researchers were blinded to any information related to hospital name, location, number of beds, and any transactional information at a single infusion level. Key performance indicators including dose error reduction software (DERS) utilization, infusion alarms and status events, good catches, overrides and library management metrics were aggregated and analyzed from the queried data. Descriptive statistics and trends on these performance metrics were generated using Microsoft Excel.

Results: This retrospective data analysis included 2,133 US hospitals, and the number of programmed infusions that were evaluated totaled 1,185,625,969. Several key performance indicators related to infusion pump utilization were assessed. Firstly, dose error reduction software usage was analyzed. DERS offers infusion rate limits and double check protection for

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the total medication dose and duration of delivery . This analysis showed an increased utilization of DERS over time. Drug library compliance is critical for the smart pump to assist in preventing adverse events. Compliance rates increased over time. Several high-risk medications also ranked among the top 10 most programmed infusions, including morphine, hydromorphone, and fentanyl. A review of the most commonly infused medications can help hospitals monitor system-wide usage trends, design targeted safety initiatives, and support opioid surveillance programs. Additional safety metrics showed an average of 13 “good catches” per site per month, 17 instances of severe harms averted per site per month, and a decrease in high risk overrides over time.

Conclusion: Overall, this analysis highlights that built-in safety features within smart pumps play an important role in reducing high risk medication errors. The dataset does not capture the impact of infusion errors on patient outcomes. Findings from this analysis can be used as a building block to benchmark indicators of smart pump utilization. This may inform opportunities for practice improvements for clinicians, medication safety professionals, and healthcare-systems, more broadly. Future research should focus on performance indicator analysis stratified by care area, drug, and shift time as well as a comparison of sites with and without interoperability.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 63-T

Poster Title: Utilization evaluation of medication override indications from automated dispensing cabinets

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Purpose: Override functions available in automatic dispensing cabinets (ADCs) permit authorized personnel to remove medications without pharmacist verification. This process increases the risk of medication errors to occur. In addition to medication safety organizations considering this action to be problematic, accrediting bodies are examining override reviews as part of the survey process. Therefore, health system pharmacies must address medications frequently dispensed from override and identify error-prone steps for future improvement efforts. The purpose of this study is to characterize medications accessible from the override function and determine next steps to improve accuracy rates for approved use.

Methods: Dispensed medications on override were exported from Omnicell's Medication Order Override Report using the OmniCenter Remote Access (OCRA) program (Mountain View, CA). Further data curation was performed using Microsoft Excel (Redmond, WA). Ten most frequently dispensed medications during override was determined using the total override dispenses occurring over four months in 2018 (August, September, October, November). Accuracy rates were determined using Excel formula logic adapted from the institution's approved Urgent Medications List for Adult and Pediatric Populations. Relationships between the time of day, accuracy, and override utilization volume was evaluated by ADC location (adult, pediatric, or emergency department) and dispensing workflow. Dispensing workflow is defined as sequential process, selecting the medication of interest and indication. Using the institution's approved Urgent Medications List, further evaluation of dispensing workflow aimed to characterize end-user accuracy in selecting appropriate agent and indication,

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respectively. Time relationship of overrides occurred using 4-hour time intervals. Percent deviations was performed, normalizing sample sizes between ADC location groupings to compare variability in override volume between 4-hour intervals.

Results: A total of 22,371 overrides were collected during the study period, further categorized by location: emergency department (n equals 11,766), adult (n equals 8263), and pediatric (n equals 2,342). Most common medications incorrectly dispensed include over-the-counter analgesics (12 percent), admixture piggybacks (9 percent), ondansetron (9 percent), and immunizations (3 percent). Among override reasons selecting during the process, Sedation (n equals 2,214), Allergic Reaction (n equals 850) and Emergent Procedure (n equals 654) were the most prevalent indications improperly selected. More overrides occurred during 0800 to 1959 compared to 2000 to 0759. Of the total overrides, 64 percent occurred during 0800 to 1959. Overrides occurred most frequently and inaccurately during 0800-1159 interval. When classifying ADCs by location, adult and pediatric areas revealed similar override trends throughout the day. Trends in ED ADCs showed lower variability. Percent standard deviations include adult, 10 percent; pediatric, 12 percent; ED, 3 percent, respectively. Users of adult ADCs show greater average accuracy (73 percent) to select eligible agents, compared to pediatric ADC users (51 percent). When selecting the correct reason for the override, a larger average decrease in accuracy is observed in adult ADC users (57 percent) than pediatric ADC users (21 percent).

Conclusion: Users performing the override function mostly occurred in emergency department ADCs with less variability throughout the day. Observed daily trends in non-emergency department ADCs suggest underlying causes exist within ordering or verifying steps in the medication use process. Low accuracies in selection of agents and indications also highlight opportunities for targeted collaboration with staff: adult services may benefit from visible medication-indication override lists whereas pediatric services may benefit from appropriate agent selection. In addition to increasing data visibility of results to nursing staff, restricting selection of identified medications would increase override dispensing accuracy and decrease the risk of errors.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 64-T

Poster Title: Administrative and behavioral interventions of compounding pharmacy technicians reduce microbiological contamination of biosafety cabinets

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Purpose: The purpose of this poster is to describe the reduction in incidence of detection of both surface and airborne biologicals in biosafety cabinets (BSCs) in response to implementation of administrative and behavioral interventions of compounding pharmacy technicians as part of environmental monitoring under United States Pharmacopeia (USP) 797 and 800. Interventions included enhanced garbing and hygiene practices. The data is a product of over 2.5 years of weekly environmental monitoring in nine BSCs in five hospital sterile compounding pharmacies.

Methods: BSC surfaces were sampled for biological contamination by contact of petri dishes containing tryptic soy agar (TSA) for bacteria and Sabouraud dextrose agar (SDA) for fungi. BSCs were sampled for airborne biological contamination by deposition of airborne particulates on petri dishes containing TSA for bacteria and SDA for fungi using Surface Air System (SAS) Duo 360 High Volume Microbial Air Sampler. Biological samples were analyzed by a qualified, independent microbiological laboratory accredited by the American Industrial Hygiene Association. Administrative and behavioral interventions were implemented in the summer of 2017 and focused on enhancing garbing and hygiene practices of compounding pharmacy technicians. Engineering controls and cleaning protocols were identical before and after the interventions. Rates of detection for total, surface, and airborne bacteria and fungi were

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determined for each BSC before and after interventions. Logistic regression models were used to calculate odds ratios and associated 95% confidence intervals and p-values to assess the effect of the intervention. All analyses were conducted in the R language and environment for statistical computing.

Results: During the program, 2,608 surface bacteria samples, 2,595 surface fungi samples, 661 airborne bacteria samples, and 663 airborne fungi samples were collected in nine BSCs in five hospital compounding pharmacies. The administrative and behavioral interventions of pharmacy technicians was associated with a significant reduction in total biologicals, from 3.41% to 1.28% (OR = 0.40, 95% CI 0.26 – 0.60, $p < 0.01$); surface bacteria, from 5.12% to 2.20% (OR = 0.44, 95% CI = 0.26 – 0.75, $p < 0.01$); surface fungi, from 1.57% to 0.025% (OR = 0.15, 95% CI 0.04 – 0.48, $p < 0.01$); and airborne bacteria, from 7.43% to 2.14% (OR = 0.30, 95% CI 0.11 – 0.78, $p < 0.01$).

Conclusion: Administrative and behavioral interventions which included enhanced garbing and hygiene practices were associated with an overall reduction in biological detection as part of regular environmental monitoring of BSCs in hospital sterile compounding pharmacies under USP 797 and 800. This suggests that adherence to, or implementation of strict hygiene and garbing practices among compounding pharmacy technicians may be protective against airborne and surface biological contamination of BSCs. A reduction of biological contamination in BSCs may reduce the risk of contaminated compounded sterile products, and intravenous infections.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 65-T

Poster Title: Contamination profiles of compounding pharmacy biosafety cabinets can inform strategies for risk reduction

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Purpose: The purpose of this poster is to describe data analytics approaches which allow for characterization of the contamination profile of biosafety cabinets (BSCs) used for compounding sterile products in hospitals. These approaches describe the differences in contamination rates: (1) between BSCs within segregated compounding areas (SCAs) and those within International Organization for Standardization (ISO) 7 classified buffer rooms, (2) among BSCs within a given pharmacy, and (3) among internal surfaces of BSCs. These findings may inform strategies for understanding contamination profiles of BSCs which may be used to implement programs for risk reduction.

Methods: BSC surfaces were sampled for contamination by contact of petri dishes containing tryptic soy agar (TSA) for bacteria and Sabouraud dextrose agar (SDA) for fungi. BSCs were sampled for airborne contamination by deposition of airborne particulates on petri dishes containing TSA for bacteria and SDA for fungi using a Surface Air System Duo 360 High Volume Microbial Air Sampler. Samples were analyzed by a qualified, independent microbiological laboratory accredited by the American Industrial Hygiene Association. Detection rates of biologicals on surfaces and in air were determined for BSCs in SCAs and for BSCs in ISO 7 classified buffer rooms. Detection rates of biologicals were also calculated for BSCs in the same pharmacies, as well as for each internal BSC surface (left wall, right wall, rear wall, and

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horizontal base). To assess the strengths of association between detection rates of BSCs in SCAs vs. BSCs in buffer rooms; between BSCs in a given pharmacy; and among internal BSC surfaces, logistic regression models were used to calculate odds ratios, associated 95% confidence intervals and p-values. All analyses were conducted in the R language and environment for statistical computing.

Results: 1,269 samples were collected in BSCs within SCAs; 8,515 samples were collected in BSCs within ISO classified buffer rooms. SCAs were associated with significant increases in detection rates of biologicals, from 1.83% to 2.27% (OR = 1.52, 95% CI 1.03 – 2.18, $p = 0.03$), mainly driven by significant increases in detection rates of airborne bacteria, from 2.68% to 6.87% (OR = 2.68, 95% CI = 1.15 – 5.75, $p = 0.01$). Detection rates of surface biologicals and airborne fungi did not differ between BSCs in SCAs vs. buffer rooms ($p > 0.05$). No significant differences in detection rates were seen among BSCs in the same pharmacies, although rates varied from 1.60% – 3.45%. Likewise, no significant differences in detection rates of biologicals were seen among surfaces in a given BSC, although rates ranged from 0.00% – 5.45% among the surfaces. The left wall of BSCs hospital-wide was associated with a significantly lower rate of detection of biologicals compared to the horizontal base, 1.03% to 2.60% (OR = 0.39, 95% CI = 0.26 – 0.64, $p < 0.01$).

Conclusion: ISO classified buffer rooms were found to be protective against contamination compared to SCAs in these data. This supports regulations restricting drugs compounded in SCAs to shorter beyond use dates. This underscores the importance of maintaining secondary engineering controls within their performance targets as their makeup may influence contamination rates of associated BSCs. There is moderate evidence to support that BSCs within a pharmacy, as well as surfaces within BSCs vary in detection rates of biologicals, suggesting that location, use, and maintenance may influence contamination patterns of BSCs.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 66-T

Poster Title: Impacting patient safety through optimization of heparin infusion use

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Purpose: In response to 161 unique reported safety events over a one year time period related to continuous intravenous (IV) heparin infusions, it was determined that a Failure Mode Effects Analysis (FMEA) should be completed. The purpose of this FMEA was to identify error points in our current process regarding continuous heparin infusions, improve the current process to increase patient safety, and thus reduce the number of errors associated with this high-alert medication. The scope of the FMEA was limited to adult inpatients, including the emergency department, but excluding patients on heparin for Extracorporeal Membrane Oxygenation.

Methods: The FMEA addressed two processes regarding the use of heparin infusions including ordering and administration/monitoring because these areas were having the highest occurrence of identified, reported errors. A multi-disciplinary team was assembled that included physicians, pharmacists, nurses, hospital lab representatives, information technology (IT) personnel and members of the Quality Improvement Program. Current ordering and administration/monitoring processes were process mapped according to workflows on two cardiovascular units where heparin is commonly used. Four meetings were scheduled to identify potential safety risks in the current process. Each step in the workflow was evaluated for safety risks, based off severity, occurrence, and detection scores. These scores were tabulated and the errors with the highest total score were assessed to be the most urgent areas for focus and improvement. After each section of the FMEA was completed, a follow up

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meeting was scheduled to create action plans to improve our current process and increase patient safety.

Results: Within the ordering process, areas for improvement that were identified included: inappropriate starting doses, inappropriate order sets selected, and a lack of obtaining an accurate patient weight. Multiple order sets were identified for continuous heparin infusions with slight variations depending on indications, patient location, and medical services/teams. The numerous order sets were streamlined to one single entry point, branching out based on indication or service to direct the provider to the desired nomogram. A heparin calculator was also implemented that utilized the patient's weight to auto-calculate initial infusion rate and bolus doses to avoid manual calculations. A request for additional beds that were equipped with scales to be utilized within the Emergency Department was also created to ensure accuracy of weights. Areas of improvement associated with administration/monitoring included: documentation of heparin infusion line location, documentation of Partial Thromboplastin Time (PTT) sample site location, and assuring that proper documentation and charting of nursing double-checks while initiating and adjusting heparin drip rates occurred within the Electronic Medical Record (EMR). This resulted in retiring of paper documentation and implementing an anticoagulation flowsheet within the EMR.

Conclusion: Heparin is classified as a high-alert medication, and it must be handled with the utmost care. Overdosing and underdosing this medication can have serious consequences for patients. In order to provide the safest environment for our patients, a multi-disciplinary team was assembled to address safety risks associated with heparin continuous infusions. The two-part FMEA that was completed readdressed our ordering, administration, and monitoring of continuous heparin infusions. Implemented changes will be continually assessed to determine the impact on patient safety and the effectiveness of the Heparin FMEA process.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 67-T

Poster Title: Vital, important, optional, not Indicated, every medication has a diagnosis (VIONE): assessing the impact of an innovative deprescribing approach: Central Arkansas Veterans Healthcare System (CAVHS)

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Purpose: Polypharmacy, or the use of more medications than medically necessary is a patient safety issue and affects a significantly increasing portion of our population. Patients at risk for polypharmacy have an increased risk of adverse outcomes associated with potentially inappropriate medications (PIM). Research clearly supports a strong correlation between polypharmacy and negative clinical consequences. Currently, there is no consistently used tool to address polypharmacy. Our goal was to implement a methodologic medication management tool that focuses on de-prescribing inappropriate medications. VIONE is a method of deprescribing which allows for improved patient safety, and improved utilization of resources.

Methods: The term VIONE is an easy to remember mnemonic of the criteria that should be applied when reviewing patient medication lists. A prescriber should ask if the prescribed medicines are: Vital (V), Important (I), Optional (O), Not indicated (N), and if Every medication has an indication (E). By applying VIONE, providers can quickly assess each medication and deprescribe those that are not clinically benefiting the patient.

Deprescribing orders were created for providers and pharmacists to document application of the VIONE methodology in the electronic health record. Deprescribing reasons include:

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Optional, Not indicated/Treatment complete, No diagnosis, Discontinued/alternate medication prescribed, Patient states no-longer taking, and Dose decrease. After appropriate education for providers and clinical pharmacy specialists, a pilot was implemented in an inpatient Geriatric Evaluation and Management unit in February 2016. The project has since expanded to all CAVHS inpatient Community Living Centers, Primary Care, and discharges for acute care patients.

At risk Veterans with >15 active prescriptions were identified and contacted by their Primary Care Clinical Pharmacy Specialist prior to their primary care appointment. Documentation of interactions were completed via a reminder dialog template which allows for tracking associated outcomes. Facility reports and measures for polypharmacy were tracked, as well as the number of Veterans reviewed, prescriptions de-prescribed, and associated cost avoidance. Post implementation, chart reviews were completed to review affected Veterans restarts and adverse events.

Results: Data revealed a 1.8% decrease in the number of CAVHS enrolled Veterans with >15 active medications, and a 4.7% decrease in CAVHS enrolled Veterans with >9 active medications since VIONE implementation (February 2016).

In 2 years, VIONE has expanded across 17 facilities impacting over 10,000 Veterans. Over 17,000 prescriptions have been deprescribed with an estimated annualized cost avoidance of over \$2.8 million.

De-prescribing reasons documented using the VIONE Tool: Not indicated/Tx Complete 58.9%, Optional 27.1 %, No diagnosis 2.5%, Dose decrease 4.7%, Alternate medication prescribed 5.4%, Patient reported no-longer taking 1.4%.

Medication classes most commonly deprescribed: Blood pressure medications, proton pump inhibitors, over the counter medications.

After 1 year, 77 % of Veterans were maintained off of deprescribed medications, except for Veterans for whom a PPI (proton pump inhibitor) was deprescribed. In that case, 46% were maintained off of their PPI. The PPI group had one documented adverse effect associated with reflux symptoms.

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Conclusion: The VIONE methodology was recognized as a Gold Status Practice by the VA in 2017. VIONE is a promising methodology that can be taught to providers for application at opportune times that will help to improve the quality of care for patients who are at risk for polypharmacy and adverse events associated with PIMs. The VIONE tool is portable and user friendly. The concept itself can be applied in multiple settings to help improve prescribing practices.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 68-T

Poster Title: Protocol development for emergency administration of naloxone by inpatient nurses for individuals with suspected opioid overdose in a hospital setting

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Purpose: Substance use disorder (SUD) is becoming more common across the United States. In particular, Ohio has become one of the most prevalent states for SUD with opioid use being a major part of this. For OhioHealth Grant Medical Center, a 680 bed Level 1 trauma center in downtown Columbus, Ohio which provides service for a population at high risk for SUD, it became apparent that a protocol was needed to support inpatient nurses to administer emergent naloxone therapy to individuals with suspected opioid overdose.

Methods: Protocol was developed by a multidisciplinary team including pharmacy, nursing and providers. This protocol focused on who can be treated, signs of opioid overdose, administration of naloxone by intranasal or intravenous route and what steps to take to manage the individual during and after the suspected opioid overdose and naloxone administration. This protocol can be used for patients, visitors, associates or anyone in the hospital with suspected opioid overdose. It is designed to be given prior to the provider arrival to not delay care to the suspected opioid overdose individual.

Results: After protocol development, contents were reviewed and approved by medication safety committee, nursing executive committee, ethics team and pain committee. To be legally binding with Ohio Boards of Nursing and Pharmacy, the protocol was then approved by the hospital medical executive committee which is comprised of providers. For protocol

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implementation, naloxone was placed in all automated dispensing devices and education was completed to coach nurses on how to administer naloxone by intranasal route.

Conclusion: Due to the current substance use disorder epidemic, this protocol development was important to allow inpatient nurses to properly care for individuals emergently with suspected opioid overdose. It shows the interdisciplinary collaboration that is necessary to treat individuals with SUD. Now that this protocol has been implemented at OhioHealth Grant Medical Center, it is undergoing approvals at all of OhioHealth sites for implementation and use.

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Submission Category: Safety/Quality

Poster Type: Evaluative Study

Session-Board Number: 69-T

Poster Title: Impact of an electronic prescribing alert on fentanyl patch utilization at a multi-hospital health system

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Purpose: The Institute for Safe Medication Practices (ISMP) recently updated guidelines for hospitals to recommend eliminating the prescribing of fentanyl patches for opioid-naïve patients. To improve the safety of fentanyl patch use, Memorial Hermann Healthcare System implemented an electronic prescribing alert for patients newly started on fentanyl patch therapy. Additionally, a manual time-out process was introduced for use by the pharmacist during order verification, with variable adoption across the system. The purpose of this study was to compare the incidence of fentanyl patch utilization in opioid tolerant patients before and after implementation of the fentanyl patch prescribing alert.

Methods: Charge data from 10 facilities (8 acute care hospitals and 2 inpatient rehabilitation hospitals) was used to identify patients that had at least one dose of fentanyl patch administered from January 2018 to December 2018. A chart review was conducted to evaluate documentation of home medications for fentanyl patches or other opioids equal to 60mg of oral morphine milligram equivalents (MME). Medication administration records were reviewed to determine total doses of opioids administered in the hospital in the 7 days prior to initiation of fentanyl patch. All opioid doses were converted to MME using a standardized conversion chart from Lexicomp. Average MME over 7 days was assessed to determine opioid tolerance. Patients were considered opioid tolerant if they had documented home use of fentanyl patches, documented home use of 60 MME of opioid daily, or average of 45 MME daily in the hospital in the 7 days prior to fentanyl patch initiation. Descriptive statistics were used to

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compare the percentage of patients before and after alert implementation with fentanyl patch use that were opioid tolerant. Total utilization of fentanyl patches was compared to patient days to evaluate potential impact of patient volumes on utilization.

Results: The percentage of patients with fentanyl patch use that were opioid tolerant increased from 62% in the pre-alert period to 73% in the post-alert period. The facility specific results ranged from a 50% increase to a 4% decrease of fentanyl patch use in opioid tolerant patients. Overall utilization of fentanyl patches decreased by 31% in the post-alert period compared to the pre-alert period. Orders per 1000 patient days decreased from an average of 1.2 in the pre-alert period to 0.8 in the post-alert period. For patients who did not have a documented home use of fentanyl patch (for which the prescribing alert would fire), there was an absolute reduction of 46% in total use and a 6% increase in use for opioid tolerant patients. Patients with documented opioid tolerance prior to admission (i.e. those with home use of fentanyl patch or 60 MME of other opioids) represented 58% of opioid tolerant prescribing in the pre-alert period and 72% in the post-alert period.

Conclusion: Findings of improved use in opioid tolerant patients and overall decreased utilization indicate improvements fentanyl patch use at our healthcare system following implementation of an electronic prescribing alert. The manual time-out was introduced to assist pharmacists when evaluating fentanyl patch orders to determine sufficient opioid tolerance to warrant transdermal fentanyl. Opportunity exists to further hardwire the time-out process to ensure appropriate pharmacist intervention on orders in opioid naïve patients. Limitations of the study include evaluation of risk versus benefit of use in hospice patients with limited alternatives for analgesia, as well as difficulty interpreting accurate utilization from patient-controlled analgesia pumps.

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Submission Category: Safety/Quality

Poster Type: Descriptive Report

Session-Board Number: 70-T

Poster Title: A quality improvement project to prevent multi-component vaccine dispensing and administration errors

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Purpose: There are 8 multi-component vaccine products that are manufactured and supplied as two vials (one powder vial and one diluent vial) that must be mixed together to form the complete dose immediately prior to administration. If the vaccines are not reconstituted with the manufacturer-supplied diluent vial, the dose is considered invalid and the patient must be re-vaccinated to ensure full protection. Cleveland Clinic inpatient pharmacy identified that these multi-component vaccine products posed a risk for error as there was no mechanism for ensuring both vials were dispensed from the pharmacy or administered by the nurse.

Methods: A quality improvement project was initiated to evaluate and mitigate risk for dispensing and administration errors of these multi-component vaccines. First, we identified which multi-component vaccines were on Cleveland Clinic inpatient formulary, how they were supplied from the manufacturer, how they were dispensed from the inpatient pharmacy, and how administration was documented by nursing. Once all data were collected, we utilized the plan-do-study-act (PDSA) cycle to implement changes to the multi-component vaccine dispensing and administration process, which included: PDSA 1: communicate which vaccines were multi-component to the inpatient pharmacy staff; PDSA 2: standardize label comments and administration instructions; PDSA 3: placed alert signs in multi-component vaccine bins in inpatient pharmacy; PDSA 4: update electronic medical record to require bar code medication administration (BCMA) of both components; PDSA 5: batched multi-component vaccines into

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“kits” that contained one powder vial and one diluent vial for storage in the pharmacy. We evaluated the impact of each cycle on a continuous basis by monitoring vial count discrepancies in the pharmacy storage bins as well as SERS events related to vaccine dispensing or administration errors related to multi-component vaccines.

Results: Cleveland Clinic formulary contains nine multi-component vaccine products. Three products were restricted for outpatient use only and were excluded from this inpatient initiative. The vaccine products differed on how the components were supplied from the manufacturer: for 4 vaccine products the powder and diluent were packaged in same box, for 1 vaccine product the powder and diluent were packaged in separate boxes, and the remaining product was packaged from the manufacturer as a single-dose kit. Nursing documentation of vaccine administration was inconsistent across the health system and current practice did not require BCMA of both vial components or documentation of lot number/expiration date of each vial. PDSA cycles 1-4 had minimal impact on dispensing and administration errors related to multi-component vaccines. PDSA5 was successful in eliminating multi-component vaccine dispensing errors as evidenced by zero vial count discrepancies and zero safety events reported in the post-intervention period.

Conclusion: The PDSA cycle is a useful medication safety tool to implement and measure process changes. A pharmacy-driven intervention to batch multi-component vaccines into individualized kits mitigated the risk of dispensing and administration errors.

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Submission Category: Women's Health

Poster Type: Evaluative Study

Session-Board Number: 71-T

Poster Title: Documentation of contraceptive counseling of potentially teratogenic medications prescribed in female Veterans of reproductive age

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Purpose: Over the last 40 years, there has been a rapid increase in the female Veteran population. Women of childbearing age comprise a large demographic of women Veterans and may require contraceptive counseling in the event a potentially teratogenic medication is prescribed. According to multiple studies, overall documentation of contraceptive counseling occurs in approximately half of this population or less. A quality improvement project was conducted to evaluate and describe the rate of documented contraceptive counseling for reproductive-aged women enrolled in Women's Health or Prime Care clinics at Michael E. DeBakey VA Medical Center (MEDVAMC).

Methods: The primary objective of this initiative is to determine the rate at which contraceptive counseling is provided to women of childbearing age prescribed teratogenic medications at a VA medical center. Secondary objectives include the rate of contraception use, the rate of pregnancy testing, and the rate of contraceptive counseling stratified by clinic (Prime Care or Women's Health). This project will be a retrospective chart review from January 2017 to August 2018. Patients included are female Veterans between 18-45 years of age who made 2 or more visits to MEDVAMC prior to filling a prescription for a HMG-CoA reductase inhibitor (statin), angiotensin-converting enzyme inhibitor (ACEI), or angiotensin II receptor blocker (ARB). Women with a documented history of hysterectomy, menopause or tubal ligation and women prescribed potentially teratogenic medications with special requirements (i.e. REMS) will be excluded. A woman will be considered to have received contraceptive

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counseling if there is evidence in the electronic medical chart that she received counseling, contraceptive pharmacotherapy or family planning counseling in the 2 years prior to the date on which the original prescription was dispensed. Pregnancy testing will be identified in the electronic medical chart by positive or negative results for human chorionic gonadotropin (hCG). Statistical analysis will include descriptive statistics and Fisher's exact test. This project has been approved by MEDVAMC Quality Assurance and Regulatory Affairs.

Results: There were 287 female Veterans identified by the above methods, and 115 were excluded (40% exclusion rate); 172 patients were included in the project. The average age was 39 years old (range 25-45), 52% (n=90) were African-American, and 69% (n=119) were enrolled in Prime Care versus Women's Health clinics (31%, n=53). Majority of patients, 66% (n=114), were prescribed a statin (atorvastatin – 73%). Approximately 33% (n=56) were on an ACEI (lisinopril – 98%), and 18% (n=31) had a prescription for an ARB (losartan – 100%); of the patients on an ACEI or ARB, 36% were concomitantly prescribed a statin. The primary objective, documentation of contraceptive counseling, occurred in 63% (n=108) of patients; in total, 42% (n=73) of patients were on some form of contraception with the most common being oral contraceptive pill (OCP) at 30%. The rate of pregnancy testing in these individuals only occurred in 63 patients (37%), and no patient had a positive pregnancy test result prior to initiating a statin, ACEI, or ARB. When stratifying the patients based on clinic type, patients enrolled in Women's Health (91%) had a significantly higher documentation rate of contraceptive counseling compared to those in Prime Care clinics (50%), $p < 0.0001$.

Conclusion: The rate of documentation of contraceptive counseling at MEDVAMC was found to be higher than reports among national studies, but there is room for improvement. In this review, the rate of pregnancy testing three months prior to initiation of a potentially teratogenic medication was low. As expected, there was a major disparity between the Women's Health and Prime Care clinics regarding documentation of contraceptive counseling; the high proportion of male patients (86%) in Prime Care clinics versus female Veterans (14%) may have contributed to this discrepancy. There is a need for increased education and awareness on this matter.