Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 1-M

Poster Title: Implementation of a health-system based pharmacy technician training program: One year later

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Purpose: As the profession of pharmacy evolves beyond the traditional practice model, expanding the responsibilities of pharmacy technicians has become increasingly necessary. With this expansion comes a need for reliable advanced training. Currently, there are no American Society of Health-System Pharmacists (ASHP) accredited or health-system based technician training programs in Connecticut. Therefore, we developed a health-system based program eligible for ASHP accreditation. Development and financial justification for the program has been described previously. Here, we describe implementation of the program, with a primary goal of ensuring high quality training to foster patient safety and create an advanced pharmacy practice model.

Methods: Program curriculum was developed to combine ASHP recommendations, Pharmacy Technician Certification Exam (PTCE) content, and institution-specific needs. Ten weeks of didactic and simulation-based learning in a classroom environment is followed by ten weeks of hands on rotation-based experiences. The institution's existing connections with the surrounding community were utilized to market the program at health career fairs and school-based events. Connections were made with the institution's Career Services department and Human Resources. A program website was created and shared on a variety of social media platforms. Pharmacy technicians and pharmacists from within the institution served as instructors and preceptors for the program. Student pharmacists also provided instruction, with supervision by current staff. In order to incentivize participation, acting as a program instructor or preceptor was built into the technician career ladder program, as well as the pharmacist teaching certificate course. To provide opportunities for tuition assistance, relationships were formed with internal and external organizations. The Connecticut Department of Labor has approved this program as part of a grant-funded initiative to sponsor low-income individuals

seeking career opportunities in healthcare. Current employees of the institution are eligible for tuition reimbursement as part of their employee benefits package. Lastly, a Preferred Hire program was developed in collaboration with Human Resources. This program provides a bonus payment to students who are hired into full-time positions within the department upon graduation.

Results: The inaugural class of the technician training program enrolled and graduated three individuals with no prior pharmacy experience. All students passed the PTCE on first attempt, prior to graduation. Additionally, all students received full-time job offers for post-graduation employment at the institution. Two students accepted the offer of employment, resulting in a 66.6 percent hire rate. Both have taken advantage of the Preferred Hire program. Traditionally, recruitment for a new hire technician can take an average of eight weeks, costing the institution $9,600 in overtime pay per hire. The hiring of two students directly from this program eliminated recruitment time, saving the organization a total of $19,200. Both graduates were hired into the institution's central pharmacy and sterile products preparation area. Traditional training in these areas takes up to ten weeks, costing $12,000 per new hire in overtime pay for training coverage. Based on their extensive training within the program, training time was reduced to five weeks per graduate, saving the institution $6,000 per graduate in overtime pay related to training. Total cost avoidance related to vacancy coverage for recruitment and training was equivalent to $31,200 for the two graduates hired. The program is considered a candidate for ASHP accreditation.

Conclusion: The health-system based pharmacy technician training program was successful in graduating an inaugural class of pharmacy technicians who were Pharmacy Technician Certification Board certified and ready to work in a health-system pharmacy with minimal training necessary. The technician training program described here serves to advance the pharmacy practice model, and provides a significant cost avoidance compared to traditional models of hiring and training new pharmacy technicians.

2017 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 2-M

Poster Title: Evaluation of a pharmacy-led bedside medication delivery service at a comprehensive cancer center

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Purpose: Despite the implementation of a transitions-of-care (TOC) program at a comprehensive cancer center, preliminary data revealed that barriers to medication access persisted as a gap in care transitions for patients. To improve medication access, a discharge concierge service, involving delivery of prescriptions to the patients' bedside before discharge, was added to the existing TOC model in April 2016. The purpose of this study was to evaluate prescription capture rate and composite 7-day and 30-day post-discharge emergency department visits and inpatient readmissions between three groups of patients who were exposed to various TOC activities with or without the discharge concierge service.

Methods: The respective institutional review boards approved this retrospective cohort study. Adult patients, admitted to the general internal medicine service between April 2016 and December 2016, were included in this study. Patients admitted with a psychiatric primary problem or discharged against medical advice, patients that expired during their first admission, and patients discharged to any facility where medication assistance was provided were excluded. Enrolled patients were divided into three groups. The first group included patients enrolled in both the discharge concierge program and experienced complete TOC. The second group included patients who experienced complete TOC alone. The third group included patients who experienced incomplete TOC alone. The primary outcome was the difference in prescription capture rate between patients enrolled in the three groups. Secondary outcomes included composite 7-day and 30-day post-discharge emergency department visits and inpatient readmissions, evaluation of the prevalence of medication regimen discrepancies identified, and patient reported metrics to assess access. An a priori sample size calculation

estimated a total of 186 patients to detect a 25 percent difference in prescription capture rate between the groups. The study cohorts were analyzed across the three groups using ANOVA for continuous parametric data and chi-square test for binary proportional data. Composite 7-day and 30-day post-discharge emergency department visits and inpatient readmissions were analyzed using logistic regression to determine the impact of study interventions on readmissions.

Results: A total of 317 patients were enrolled in the three study groups; 56 in the first group, 70 in the second group, and 192 in the third group. The baseline characteristics were similar between groups for all parameters assessed with the exception of: age, English-speaking, payer, and primary admission diagnosis of thrombosis. The prescription capture rate for the group that received the discharge concierge service was higher than the other study groups (p less than 0.05). Of note, there was no difference in average number of discharge prescriptions per patient between groups (p equals 0.40). Both bivariate and multivariate analyses revealed no significant difference with respect to composite emergency department visits and inpatient readmissions at 7-days (p equals 0.177) and 30-days (p equals 0.523) post-discharge. There was no significant difference (p equals 0.068) in the number of patients who reported difficulty taking their medications between groups. Patients enrolled in the group that received the discharge concierge service reported significantly less (p equals 0.023) difficulty obtaining medications compared to patients enrolled in the other two groups.

Conclusion: Limited evidence exists regarding the impact of adding a pharmacy-led discharge concierge program to an existing TOC-program. The study findings revealed that such an intervention resulted in an increased prescription capture rate and reduced patient reported difficulty in obtaining discharge prescriptions.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 3-M

Poster Title: Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011

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Purpose: Inappropriate use of antibiotics is responsible for rising antibiotic-resistant infections and adverse drug reactions. National measures and goals have targeted specific age groups and diagnosis on appropriate antibiotic use but there is no current overall estimate of outpatient antibiotic use that includes all diagnosis and ages. This project was to designed to establish a baseline of current rate outpatient use of oral antibiotics by age and diagnosis, estimating overall rate of inappropriate outpatient antibiotic prescriptions in the United States.

Methods: National Ambulatory Medical Care Survey (NAMCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS) were used to estimate baseline antibiotic prescribing rate. All visits during the year of 2010-2011 were included in the study unless the visits resulted in hospital admission or if parenteral antibiotics were prescribed without oral antibiotics (0.4% of visits). Total number of 184 032 ambulatory care visits were sampled. Using the surveys, annual numbers and population-adjusted rates with 95% confidence intervals of ambulatory care visits with oral prescription for antibiotics by age, region, and diagnosis were estimated. National guidelines and regional variation in prescribing were used to determine diagnosis-specific prevalence and rates of total and appropriate antibiotic prescriptions. These rates were combined to calculate estimate rate of appropriate annual antibiotic prescriptions per 1000 population.

Results: Of the 184 032 sampled ambulatory care visits, 12.6% of visits resulted in prescription for antibiotics (95% CI, 12.0%-13.3%). The estimated antibiotic prescriptions were 506 (95% CI, 458-554) per 1000 population. Antibiotic prescribing rates were 423 (95% CI, 343-504) in the West and 553 (95% CI, 459-648) in the South. With 1287 antibiotic prescriptions (95% CI, 1085-1489) per 1000 population, annual antibiotic prescription rate was highest with children of 0 to 2 years. The diagnosis with the most antibiotic prescriptions per 1000 population was sinusitis (56 antibiotic prescriptions [95% CI, 48-64]), followed by suppurative otitis media (47 antibiotic prescriptions [95% CI, 41-54]), and pharyngitis (43 antibiotic prescriptions [95% CI, 38-49]). Patients with acute respiratory conditions were prescribed to 221 antibiotic prescriptions (95%

CI, 198-245) but only 111 antibiotic prescriptions were estimated to be appropriate. Accounting for all conditions and ages In the year of 2010-2011, an estimate of 506 antibiotic prescription per 1000 population (95% CI, 458-554) was produced but only 353 antibiotic prescriptions were estimated to be appropriate.

Conclusion: In the year of 2010-2011, the estimated annual antibiotic prescription rate in the United States was 506 out of 1000. However, only 353 antibiotic prescriptions were likely to be appropriate, which suggests the need for antibiotic stewardship in outpatient settings.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 4-M

Poster Title: Assessing pharmacist impact on pharmacogenomic testing implementation in a primary care setting

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Purpose: Pharmacogenomic (PGx) testing can be performed in primary care setting reactively or preemptively to optimize pharmacotherapy, reduce treatment failures or suboptimal clinical outcomes, and minimize toxicity. The American Society of Health-System Pharmacists (ASHP) described the pharmacists' unique positioning to lead PGx testing initiatives. Limited information exists regarding integration of pharmacists in primary care PGx workflow. This project was designed to evaluate the practical viability of pharmacist-managed clinical pharmacogenetics service in a primary care setting.

Methods: A PGx testing program was implemented at an integrated, inter-professional primary care-behavioral health center in October 2015 in Tucson, Arizona. The program was designed to facilitate the process of prescribers (a primary care provider and a psychiatrist) ordering category-specific PGx panels for their patients; three panels were available to patients: cardiovascular; neurological; and thrombophilia. A pharmacist was hired to provide clinical services including PGx consultation, beginning in January 2016. To assess the impact of pharmacist integration into the PGx testing workflow, a retrospective chart review was performed. PGx program data was collected for two time periods: before (October to December 2015) and after (January 2016 to December 2016) integration of the pharmacist in to the clinic. Main outcome measures compared: proportion of patients with PGx reports that were reviewed within 30 days; median time from test report availability date to test review date; and PGx-based therapy recommendations. Prescriber acceptance rates of pharmacist recommendations and assessment of recommendation implementation also were assessed. Non-normally distributed continuous data were assessed using a Mann Whitney U test; proportional data were assessed using a chi-square or Fisher's exact test with an alpha level set at 0.05.

Results: A total of 166 PGx reports were reviewed for 137 patients. The pharmacist reviewed 87 reports (68 patients) compared to prescribers who reviewed 79 reports (69 patients). Of the total reports reviewed, 59% provided PGx-based therapy recommendations for 109 medications. The most common medication classes identified on PGx reports were: antidepressants (48%), opioids (21%), and antipsychotics (13%). The proportion of patients with PGx reports reviewed within 30 days did not differ significantly (p-value =0.563) between the pharmacist and prescribers. The median turn-around time from report availability to review date for pharmacist did not differ significantly (p-value =0.06) compared to prescribers. The pharmacist and prescribers reviewed 73 PGx-based therapy recommendations each identified from PGx reports. There were significant differences (p-value < 0.0001) in the number of actionable medication-related recommendations made between the pharmacist 68 (93%) and prescribers 18 (25%). Significant differences in types of recommendations made (p-value < 0.0001) also were observed between pharmacist and prescribers for: monitoring effectiveness/safety (51 vs. 13), drug change (12 vs. 3); dose change (2 vs. 1); and discontinue therapy (3 vs. 0). Of the 68 recommendations made by pharmacist, 26 (38%) were accepted by prescribers and resulted in 14 medication discontinuations and 7 medications dose changes.

Conclusion: This retrospective evaluation of a pharmacist-managed clinical pharmacogenomics service showed statistically significant differences in types of PGx-based recommendations made by the pharmacist compared to prescribers. The results are also encouraging given that prescribers were receptive to pharmacist-led PGx testing result review and interpretation. This evaluation highlights the leadership role of the pharmacist in a primary care setting and in helping improve patient outcomes, however more research is needed to evaluate these services among more diverse populations and in similar settings.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 5-M

Poster Title: Evaluating the impact of a bedside discharge pharmacist on economic, clinical and humanistic outcomes

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Purpose: Transitions of care is a broad range of services designed to ensure health care continuity, avoid preventable poor outcomes and promotes the safe and timely transfer of patients across the continuum of care. The bedside discharge service at Kaiser Permanente (KP) Riverside Hospital was implemented to optimally address the Healthcare Effectiveness Data and Information Set (HEDIS) measures and improve the patients' understanding of adherence to their medication regimen prior to discharge. The purpose of this study was to analyze the impact of the bedside discharge service on reducing 30-day readmission rates in the intervention versus the control group.

Methods: The institutional review board approved this retrospective, data only, controlled group study. Patients who were 18 years of age or older with a LACE score greater than 10 (LACE: length of stay, acuity of admission, comorbidities, emergency department (ED) visits) and were discharged from KP Riverside Hospital between November 1, 2015 and October 31, 2016 were included. Data was abstracted and analyzed from electronic medical records. Patients discharged to hospice care, skilled nursing facilities, against medical advice were excluded. 1400 admissions were included in the study. The intervention group (n=700) received bedside discharge counseling, medication delivery, a patient friendly medication list and a comprehensive medication reconciliation. The control group (n=700) were weekend discharges. The primary outcome of the study was 30-day readmission rate. Secondary outcomes included ED visits 30 days post hospital discharge, kept post hospital discharge visits within 7 to 14 days, and primary medication adherence. A return on investment calculation was done utilizing cost avoidance of 30-day readmissions and ED visits. A post study questionnaire was administered and collected between November 1, 2016 and January 31, 2017 to assess patient satisfaction. It was determined that 682 admissions per study group would yield 80 percent power to detect 5

percent reduction in 30-day readmission rates. Data are expressed as percentages and means with 95 percent confidence intervals reported when appropriate.

Results: The intervention group 30-day readmission rate was 23% compared with 33% in the control group (P less than 0.0001). Primary medication adherence was 96.43% in the intervention group compared with 87.86% in the control group (P less than 0.0001). 30-day ED visits did not change significantly between the intervention group and the control group (P equals 0.447). The return on investment for providing the bedside discharge service was 6.76.

Conclusion: Having a pharmacist provide bedside discharge counseling and education at the bedside prior to discharging the patient, significantly reduced 30-day readmission rate in the targeted population and improved primary adherence. In addition, the return on investment of the service was highly favorable and warrants further investigation via a cost benefit analysis study.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 6-M

Poster Title: Pharmacists' impact on dose optimisation and detection of adverse drug events in patients with rheumatoid arthritis

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Purpose: Nearly one in four rheumatoid arthritis patients may require a withdrawal of nonbiologic disease-modifying antirheumatic drug (nb-DMARD) therapy due to adverse drug events. The American College of Rheumatology recommends regular monitoring of rheumatoid arthritis patients, especially in the first six months of nb-DMARD therapy. Careful dose titration of nb-DMARDs by healthcare professionals may be useful in the prevention and/or early detection of adverse drug events. This study investigated the impact of pharmacists' involvement on dose optimisation of nb-DMARDs and the detection of adverse drug events among rheumatoid arthritis patients.

Methods: We performed a retrospective review of casenotes and medication records of rheumatoid arthritis patients from March 2013 to February 2016. The impact of pharmacists' involvement was examined in a pre- vs post-cohort, i.e. 12 months prior to, and 24 months following the launch of a pharmacist-led rheumatology clinic. All patients identified were followed for 12 months. We compared the percentage of patients in the standard care and physician-pharmacist collaboration group that achieved optimal doses of nb-DMARD (as per therapeutic targets based on patient-clinician considerations), and compliance to American College of Rheumatology recommendations on nb-DMARD monitoring, as well as the incidence and characteristics of nb-DMARD-associated adverse drug events. Between-group comparisons were made using Chi-square analysis. Patient satisfaction to pharmacist clinic was measured using a five-point Likert scale.

Results: Thirty-eight patients each in the standard care group and physician-pharmacist collaboration groups were reviewed. More patients in the physician-pharmacist collaboration

group achieved nb-DMARD dose optimisation within a year of initiation of therapy (70.6 percent vs. 47.1 percent; p less than 0.05). Compliance to American College of Rheumatology recommendations on nb-DMARD monitoring was significantly higher in the physician-pharmacist collaboration group (72.7 percent vs. 44.1 percent; p less than 0.05). Pharmacists more frequently identified nb-DMARD-associated adverse drug events (28.9 percent vs 15.8 percen; p less than 0.05). Overall, 17 patients (22.4 percent) experienced withdrawal of nb-DMARD therapy within a year of initiation due to adverse drug events. The most common adverse drug events were gastrointestinal (29.4 percent), dermatological (17.6 percent) and hepatic (17.6 percent) in nature, most of which were only mildly severe. All patients who participated in the survey, reported satisfaction (mean Likert score 4.45/5) with their experience in the pharmacist-led rheumatology clinic.

Conclusion: Pharmacists' involvement contributed to an improvement in nb-DMARD dose optimisation, compliance to American College of Rheumatology guidelines on monitoring, and detection of nb-DMARD-related adverse drug events. Prompt pharmacist interventions will prevent and/or mitigate the risk of severe events. The study also showed good acceptance by patients to the pharmacist-led rheumatology clinic.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 7-M

Poster Title: Adherence to COPD guidelines in the ambulatory care patient population

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Purpose: The purpose of this study was to determine whether establishing and assigning patients' Global Initiative for Chronic Obstructive Lung Disease (GOLD) category according to established criteria and making corresponding therapy recommendations results in more patients on guideline appropriate therapy post-intervention compared to baseline and compared to a control group.

Methods: This study was approved by the Investigation Review Boards at the study sites. This was a prospective quasi-experimental study in ambulatory patients diagnosed with COPD (ICD-diagnosis code of COPD (496.0) for at least 1 year and a ratio of FEV1/FVC of 0.7 or less. All patients (intervention and control) were contacted via telephone to provide verbal consent along with the COPD assessment test (CAT) survey at the time of patient entry into the study. A CAT of ?- 10 is defined as having more symptoms and < 10 as having less symptoms. For patients in the intervention group, documentation of the patient's 2011 GOLD category and corresponding therapeutic recommendation was placed in the patient electronic medical record and forwarded to the primary care physician for review. For patients in the control group the 2011 GOLD category was documented in the electronic medical record but not sent to the primary care physician. Descriptive statistics were used to characterize guideline adherence.

Results: 22 patients in the intervention group and 9 patients in the control group were enrolled. The majority of patients in intervention and control groups were male (59% and 60%, respectively) and Caucasian (86.4% and 66.7%, respectively). The median age was 69 years (IQR 66-69) and 61 years (IQR 58-66) (intervention vs. control). At baseline, median CAT score was 14.5 (IQR 9-19) and 17 (IQR 13 ?" 20) (intervention vs. control). Six intervention and 2 control patients were lost to follow up. 12 patients (55%) in the intervention group and 2 patients

(22.2%) in the control group were classified as GOLD category D. At follow up, 7/16 patients (43.4%) in the intervention group and 1/7 patients (14.3%) in the control group were classified as GOLD category D. At baseline, 77.3% of patients in the intervention group and 55.6% of patients in the control group met criteria for appropriate therapy. 18.2% of patients in the intervention group and 44.4% of patients in the control group met criteria for over-prescription. At follow up, 9 /16 patients in the intervention group and 2/7 in the control group met criteria for appropriate therapy. 5/16 patients and 4/7 patients (intervention vs. control) met criteria for over-prescription.

Conclusion: Assigning a GOLD category and documenting a therapeutic recommendation did not result in an increase in the number patients on guideline appropriate therapy.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 8-M

Poster Title: Incorporating pharmacy informatics developed CDS screens into the EHR workflow to meet antimicrobial stewardship metrics and regulatory requirements

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Purpose: The purpose of clinical decision support (CDS) should first and foremost be to improve patient outcomes and incorporate medication safety throughout the electronic health record. Although the clinical needs are priority, operational and regulatory requirements are increasingly influencing the workflow of all provider types. A CDS to support appropriate antibiotic ordering and duration of therapy was developed to achieve the clinical, operational, and regulatory goals of a large healthcare system.

Methods: In an effort to improve antibiotic stewardship in conjunction with the roll out of Meaningful Use Stage 2 requirements. CDS screens were designed and developed to optimize the duration of treatment for antibiotics based upon the prescribed indication. These screens were developed with direction form the corporate Antimicrobial Management Program (AMP) to ensure clinical appropriateness around high risk and high cost antibiotics. With the success of the screens on a limited number of antibiotics further CDS screens were developed for antibiotics. With the expansion of these CDS screens to more antibiotics, this new functionality will increase patient safety and antibiotic transparency enterprise wide. Antimicrobial stewardship programs seek to limit the inappropriate use of antibiotics, improve patient outcomes, and manage drug costs efficiently. These efforts are designed to limit the development of antimicrobial resistance, which threatens the effective prevention and treatment of an ever-increasing range of infections. By incorporating these practices into a CDS, we were able to provide an avenue for providers to document the indication of use of antimicrobials with an expected duration of therapy without interrupting their current workflow. The screens will also assist all facilities in meeting the new CDC Hospital Antibiotic

Stewardship Program Core Elements, The Joint Commission's Antimicrobial Stewardship elements, and Centers of Medicare and Medicaid Services' (CMS) recently proposed Condition of Participation (COP).

Results: Through the collaborative efforts of a multidisciplinary team, CDS screens to capture antibiotic indications and duration of therapy for antibiotics were developed and deployed throughout the enterprise. These screens capture vital information that is necessary for all members of the patient care team to provide the best care possible. Embracing this initiative allows us to continually work to improve our performance in this arena for the good of our patients. With the data we collect, we can retrospectively review and determine if adjustments to the way we use antimicrobials in the future are needed. These may include protecting certain antibiotics as well as recommending shorter treatment durations when appropriate. In addition, with the deployment of these CDSs the new CDC Hospital Antibiotic Stewardship Program Core Elements, The Joint Commission's Antimicrobial Stewardship elements, and Centers of Medicare and Medicaid Services' (CMS) recently proposed Condition of Participation (COP) were able to be met along with the company's own operational quality improvement program goals.

Conclusion: The successful implementation of this project shows the ability to impact clinical, operational, and regulatory goals for a large healthcare system. Documenting the indication ensures proper dosing for a particular condition, improves medication safety, and assists with transitions of care by communication the reason for the medication. In the wake of this project's success increased demand has been seen for other projects similar to this one as well as enterprise wide requests to expand the functionality of the current antibiotic and duration of therapy CDS screens.

Submission Category: Automation/ Informatics

Session-Board Number: 9-M

Poster Title: TIRES study: multicenter study to evaluate the benefits of technology-assisted workflow on IV Room efficiency, costs and safety - medication errors analysis

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Purpose: Injectable medications administered in the United Sates are associated with an estimated 1.2 million preventable adverse drug events each year, resulting in $2.7-$5.1 billion in additional healthcare costs. Some of these errors that may lead to patient death or harm originate in the hospital pharmacy during medication compounding. Technology-assisted workflow (TAWF) systems have been introduced into the sterile compounding processes in order to reduce medication errors. This study compares the frequency of IV sterile compounding errors identified in medical centers that utilize a TAWF system (DoseEdge®, Baxter Healthcare Corporation, Deerfield, IL) compared to medical centers that have not implemented it.

Methods: Four of the sites that participated in the study currently utilize TAWF in their IV Rooms: IU Health Bloomington, Hallmark Health System, Allegheny General Hospital, and Maine Medical Center. Four of the sites that participated did not have any TAWF implemented at the time of data collection: University of North Carolina Medical Center, Eastern Maine Medical Center, University of Alabama at Birmingham Hospital, and Johns Hopkins Bayview Medical Center. A data collection protocol was designed and utilized for both the TAWF and non-TAWF sites. The sites with TAWF ran the intercepted errors and rejected dose detail by technician report, removing any identifiers and duplicates. These reports allowed for the error rate and error categories to be determined. The non-TAWF sites utilized a manual error collection form that needed to be completed when an error was detected during the process of sterile compounding. These error categories were cross-walked with the report from the TAWF

system, allowing for comparison across institutions. Each site collected detected medication errors in the IV room for a 12-week period.

Results: The total number of reported intercepted errors was 2,679 for the TAWF sites and 739 reported intercepted errors for the non-TAWF sites. The total number of doses processed through the TAWF during the study period was 96,865 doses and the estimated total number of doses in the IV room in non-TAWF hospitals was 244,273. The combined frequency of intercepted errors in the preparation of sterile products detected by workflow type for the 12 weeks were 3.13% for the TAWF sites and 0.22% for the non-TAWF sites. The frequency average for the top three error reporting categories for the TAWF sites were incorrect medication (63.30%), incorrect base fluid volume (10.81%), and incorrect medication volume (6.2%). The frequency average for the top three error reporting categories for the non-TAWF sites were incorrect medication volume (18.34%), incorrect base fluid volume (17.35%), and incorrect medication (16.99%).

Conclusion: The use of a TAWF system detected 14 times more errors than were identified via manual workflow alone. This does not mean that those systems were not more error-prone, but probably due to the increase in detection potential arising from technology. Additionally, the category of errors detected most frequently such for the TAWF sites was "incorrect medication", whereas "incorrect medication volume" was the most frequent error category for the non-TAWF sites. It appears that there is an under-reporting of errors in compounding sterile products when not utilizing TAWF systems, and the potential for these errors reaching the patient is increased.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 10-M

Poster Title: TIRES study: multicenter study to evaluate the benefits of technology-assisted workflow on IV Room efficiency, costs and safety - turn-around time analysis

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Purpose: The time that it takes to prepare and dispense a medication can have an impact on patient care. The delay in therapy that results from longer medication turn-around times (TAT) may result in adverse patient outcomes and tension with nurses expecting their doses. Additionally, longer TATs in the IV Room may increase overall costs, because it requires additional pharmacist and pharmacy technician time that is focused on prescription compounding. This study aims to compare the TAT of IV sterile compounding products in centers that utilize a TAWF system (DoseEdge®, Baxter Healthcare Corporation, Deerfield, IL) compared to those without it.

Methods: Four of the sites that participated in the study currently utilize TAWF in their IV Rooms: IU Health Bloomington, Hallmark Health System, Allegheny General Hospital, and Maine Medical Center. Four of the sites that participated did not have any TAWF implemented at the time of data collection: University of North Carolina Medical Center, Eastern Maine Medical Center, University of Alabama at Birmingham Hospital, and Johns Hopkins Bayview Medical Center. A data collection protocol was designed and utilized for both the TAWF and non-TAWF sites. The sites with TAWF determined their data from the turn-around time by technician report, removing any specific identifiers and duplicates. These reports allowed for the time to complete each workflow step to be determined. The non-TAWF sites recorded turn-around time data by stop-watch for the three time points: preparation, compounding, and verification. Both TAWF and non-TAWF sites created a medication use process map to outline their procedure for compounding sterile products.

Results: The average preparation, compounding, and verification times for the non-TAWF sites were 235.75 seconds (3.93 minutes), 313 seconds (5.22 minutes), and 217.25 seconds (3.62 minutes) respectfully. The average combined time to complete all three time points was 766 seconds (12.77 minutes) for the non-TAWF sites. The average Printed-Sorted time (the time the label was printed to the time the dose was sorted) across the TAWF sites was 25.12 minutes.

Conclusion: On average, the total time to compound a medication using TAWF appears longer. It is important to note that the verification time for the TAWF sites includes the amount of time that the prescription sat idle before the pharmacist checked it; whereas, for the non-TAWF sites, manual collection of the turn-around time data was halted between compounding and verification and represents the true verification time. This caused the verification times for the TAWF sites to be falsely elevated. Analysis of medication types, cost of salary and wastes, time at each step, and efficiency of the medication use process is needed.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 11-M

Poster Title: Improving Provider Order Entry: Identification of Customizable Medication Routes Utilizing Lean Methodology

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Purpose: When providers enter electronic orders at Veterans Affairs hospitals and clinics, they are presented with a list of possible medication routes for the chosen orderable item. Until recently, this list was not editable and was defaulted based on the dosage form (i.e. all solutions displayed the same routes). Consequently, some orderable item-route pairings may have been clinically inappropriate increasing the risk for order entry error, possibility of harm to patients, and time to fix the order. New functionality allows for customizing this list to the orderable item. The goal was to analyze electronic orders for the clinical appropriateness of

Methods: the routes associated with the most utilized orderable items. (Methods) Data was extracted using Microsoft's SQL Server Management Studio and Vista's File Manager. All analysis was performed in Microsoft Excel 2010. The orderable item, dosage form, and route were reported for all orders entered between December 2015 and November 2016. Lean practices were employed to determine which orderable items to focus on, as management of all files would be a large undertaking. This study focused on a cohort of orderable items at the onset to create a plan for continuous improvement after study completion. Prior to analyzing each orderable item and route combination, medication routes were determined "appropriate" if the orderable item's medication route list was already customized, or if the dosage form's default route list contained singular/redundant routes (e.g. ophthalmic dosages containing "left eye", "right eye" and "both eyes" as possible routes). The remaining orderable item-route pairings were evaluated with the package insert, Micromedex, and the Handbook of Drug Administration via Enteral Feeding Tubes. (Results) In the one-year study period, 1,049,908 medication orders were placed through provider order entry. It was determined that 375 orderable items represented 90% of all medication orders. All 375 orderable items were evaluated. The orderable item-route pairings deemed appropriate and requiring no further

evaluation represented 15.5% of orders. A total of 1,210 orderable item-route combinations, representing 74.9% of all

Results: medication orders, were evaluated individually using clinical resources. 1,014 orderable item-routes (representing 783,341 orders) were verified as clinically appropriate. 165 orderable item-routes (representing 3,189 orders) had insufficient evidence with the available resources, and 31 orderable item-routes (representing 539 orders) contained potentially inappropriate medication routes. Lastly, 763 orderable item-routes were not utilized at all through provider order entry during the study period. (Conclusion) The study found that < 0.1% of medication orders contained potentially inappropriate medication routes. The orders determined to be "potentially inappropriate" cannot be assumed to be medication errors; the data collected were for all written orders and not necessarily verified or administered. The clinical resources utilized were based off of FDA approved routes, correspondence with drug manufacturers, and some studies. This list is not exhaustive. The next logical step is to update the orderable items and investigate those identified with missing or contradictory evidence with the ultimate goal of ensuring that the displayed medication routes are appropriate to support safe ordering and prescribing. From here, reporting tools may be built to display (1) medication orders that contain a route not in the orderable item list, (2) orders corresponding to orderable items not on the list of 375 and

Conclusion: (3) specific routes that have not been utilized for a long period of time. All of these reports will allow for continuous evaluation and quality improvement. Once the orderable items are updated with the appropriate routes, they cannot be assumed to be appropriate in all cases. The verifying pharmacist still must perform due diligence during order verification. From a system perspective these results are relevant due to ubiquity of this issue, whereas the solution is the responsibility of the individual VA hospital. Results and techniques will be shared with stakeholders across the VA.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 12-M

Poster Title: Peritoneal dialysis workflow analysis and enhancement with computerized provider order entry (CPOE) updates in a large academic medical center

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Purpose: Peritoneal dialysis (PD) is an ambulatory process that is often continued during inpatient admission. Current PD workflow did not support the barcode medication administration (BCMA) process utilized in an academic medical center due to the inability of the system to recognize barcodes on the dialysate preparations and resulted in patient harm events. PD utilizes high variability in dialysate preparations and the absence of the BCMA safety elements was identified as a patient safety issue to be resolved. This project was designed to improve the clinical workflow with peritoneal dialysis and to enhance patient safety.

Methods: Pharmacy informatics residents met regularly with pharmacy operations, physicians, nursing, and central supply leaders at Vanderbilt University Medical Center (VUMC) and Monroe Carell Jr. Children's Hospital at Vanderbilt (MCJCHV) to discuss workflow analysis and enhancements, with additional goals of reducing the burden on nursing and allowing for barcode medication administration of PD products. Another goal was to standardize peritoneal dialysate inventory at the Children's Hospital from multiple manufacturers to a single manufacturer and to allow for simpler inventory management. Once changes to the workflow were approved, the residents built select peritoneal dialysates as orderable items in the computerized provider order entry (CPOE) system to allow for pharmacist verification of the preparations and subsequent barcode medication administration. The residents provided continuing education sessions for pharmacists and technicians on the clinical features of peritoneal dialysis and the workflow process change. The residents also collaborated with nurse and physician educators to develop training materials for additional clinical personnel.

Results: The complexity of this workflow implementation progressively increased during the project timeline. Collaboration proved to be a challenge, especially when working on a project with various moving parts and several disciplinary groups. The limiting factor in the

implementation progression was obtaining information and gathering the correct individuals together. Many times, meetings would be set up with only fractions of groups in hopes of following up at a future date. The peritoneal dialysis order set and ordering page were modified to allow for the dialysate and additives to be ordered as a single order rather than separate orders. This change was performed to provide increased clarification on the desired amount and administration of the additives. The inventory of peritoneal dialysis bags at VUMC remained unchanged; however, some items were removed at MCJCHV for more streamlined inventory management. The 2016 International Society for Peritoneal Dialysis peritonitis guidelines and physician recommendations were used for antibiotic and non-antibiotic additive dosages, respectively.

Conclusion: An improved workflow for peritoneal dialysis has been a long-awaited request. This implementation offers a drastic process improvement, especially regarding elements of documentation. The overall process from start to finish has been overwhelmingly well-received by physicians, nurses, and pharmacists. As the institution transitions to a new CPOE software in the coming months, these enhancements will be used as a template to assist development in the new system.

2017 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 13-M

Poster Title: Diagnosis of stroke associated with overutilization of thrombophilia testing

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Purpose: Clinical practice guidelines have suggested the benefit of thrombophilia testing in patients diagnosed with stroke, particularly in young patients and in cryptogenic stroke. However, recent studies have called into question the clinical utility of thrombophilia testing in stroke patients. The purpose of this study was to systematically determine the clinical utility of thrombophilia testing for patients presenting with stroke at an academic medical center and to compare tests for stroke patients to tests for non-stroke patients.

Methods: Adult patients who received thrombophilia testing during a hospital or emergency department visit during a six month time period were retrospectively identified and a manual chart review was performed to gather patient and testing outcomes. Thrombophilia tests associated with minimal clinical utility were defined as tests meeting at least one of the following criteria: patient discharged before test results available; test type not recommended; test occurred in situation associated with decreased accuracy; test was an erroneous duplicate; and test followed a provoked thrombotic event. The utility of thrombophilia testing was analyzed using regression models and compared between patients whose testing was prompted by stroke versus those whose testing was prompted by other indications. This research was approved by the institution's IRB with a waiver of informed consent.

Results: Over six months, 1451 thrombophilia tests were performed for 163 patients. Testing was prompted most often by stroke (57 patients) and tests for stroke patients accounted for half of all thrombophilia tests. Overall, 93 percent of tests for stroke patients were associated with minimal clinical utility vs 68.9 percent for non-stroke patients (odds ratio 6.0, 95 percent confidence interval [2.0 ?" 17.9]). Testing in stroke patients was also associated with a higher number of thrombophilia tests per admission compared to testing in non-stroke patients (mean [standard deviation] 12.7 [7.0] vs 6.8 [4.2], respectively, p value less than 0.01). The number of

tests ordered and patient age contributes to the positive association between testing in stroke patients and minimal clinical utility.

Conclusion: Thrombophilia testing in the acute setting for stroke patients was associated with an increased risk of testing meeting criteria for minimal clinical utility. Given these results, the unclear benefit of testing in stroke patients, the cost of thrombophilia tests, and the high proportion of tests ordered for stroke patients, alterations to current thrombophilia testing practices may be warranted.

2017 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 14-M

Poster Title: Type of beta-blocker use by diabetes status and associated outcomes in older nursing home residents after acute myocardial infarction

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Purpose: Beta-blockers are a mainstay of treatment after acute myocardial infarction (AMI) for older nursing home (NH) residents. Previous studies with beta-blockers have implicated differing effects on metabolic parameters, including hemoglobin A1c. Worsening glycemic control could be a clinically important consideration for frail NH residents with type 2 diabetes mellitus (T2D). We assessed whether NH residents with T2D preferentially received T2D-friendly (versus T2D-unfriendly) beta-blockers after AMI, and evaluated their comparative effects.

Methods: This retrospective cohort study of NH residents with AMI from May 1, 2007, to March 31, 2010, used national data from the Minimum Data Set, version 2.0, and Medicare Parts A and D. Individuals with beta-blocker use greater than or equal to 4 months before AMI were excluded. T2D-friendly beta-blockers included those with vasodilating properties: carvedilol, nebivolol, labetalol, acebutalol, and betaxolol. All other beta-blockers were defined as T2D-unfriendly. Outcomes included functional decline, all-cause death, all-cause rehospitalization, and hospitalized hypoglycemia, hyperglycemia, and fracture events in the first 90 days after AMI. Functional status was measured using the Morris scale of independence in activities of daily living. We used binomial and multinomial logistic regression models to compare T2D-friendly versus T2D-unfriendly beta-blocker users after propensity score matching.

Results: Twenty-nine percent of 2,855 NH residents with T2D initiated a T2D-friendly beta-blocker versus 24 percent of 6,098 residents without T2D (p-value < 0.001). The matched cohort comprised 1,530 residents with T2D. The matched cohort was well balanced with

respect to age, sex, race, chronic conditions, functional status, and cognitive status. Among the matched cohort, there were 271 functional decline, 158 death, 476 rehospitalization, 21 hypoglycemia, 32 hyperglycemia, and 8 fracture events. Use of T2D-friendly versus T2D-unfriendly beta-blockers was associated with an overall increase in all-cause rehospitalization (odds ratio [OR] 1.26, 95 percent confidence interval [CI] 1.57, NNH 21), but a reduction in hospitalized hyperglycemia (OR 0.45, 95 percent CI 0.21-0.97, NNT 64). Use of T2D-friendly versus T2D-unfriendly beta-blockers was not observed to impact hospitalized hypoglycemia (OR 2.05, 95 percent CI 0.82-5.10), all-cause death (OR 1.06, 95 percent CI, 0.85-1.32), functional decline (OR 0.91, 95 percent CI, 0.70-1.19), or hospitalized fracture events (OR 1.7, 95 percent CI 0.4-7.0).

Conclusion: NH residents with T2D were more likely to receive T2D-friendly beta-blockers. T2D-friendly beta-blocker use was associated with an increase in all-cause rehospitalization and a reduction in hospitalized hyperglycemia, though biases from residual confounding and differences in loss to follow-up remain plausible alternative explanations for these findings. The use of T2D-friendly versus T2D-unfriendly beta-blockers did not affect mortality or functional decline.

2017 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 15-M

Poster Title: Policy change for deep vein thrombosis treatment - moving from warfarin to novel oral anticoagulants: effect on length of stay and hospitalization costs

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Purpose: The introduction of novel oral anticoagulants **(**NOACs) for the treatment of deep vein thrombosis (DVT) has allowed for reallocation of resources to manage uncomplicated DVT primarily in the outpatient setting. Through adoption of a system-wide clinical practice guideline, Renown Health (a large, locally owned, not-for-profit integrated healthcare network in Reno, NV) has shifted its treatment of DVT to the NOAC rivaroxaban, coupled with prompt follow-up in a pharmacy-directed outpatient anticoagulation clinic. We examined hospitalizations and costs before and after the policy change (July 1, 2013).

Methods: The analysis used a longitudinal cohort-control group design with propensity weighting to create a pseudo-population of pre-policy change patients whose pre-referral characteristics matched those of the post-policy change patients. Between July 1, 2010 and September 30, 2015, patients (?-18 years of age) who had evidence of a new DVT and received a prescription for warfarin or rivaroxaban within 7 days following the DVT index date were eligible. Outcomes included the average total number and total costs of all-cause overnight stays in an inpatient setting for the first 30 and 60 days after referral across all patients. Analyses controlled for referral location (inpatient, urgent care, or ER), and propensity scores were developed using a non-parsimonious logistic regression model. Data from 180 days prior to the DVT index date were used in the propensity model to balance the cohorts. Primary analyses used propensity-weighted generalized linear models.

Results: The study cohorts consisted of 343 patients in the pre-policy change group (median age 64.4, 50.7% female) and 266 patients in the post-policy change group (median age 63.0,

51.9% female). For the first 30 days after referral, the propensity-weighted estimated mean (95% confidence interval [CI]) number of all-cause nights in an inpatient setting across all patients was 1.3 (0.8-2.0) before the policy change and 0.66 (0.4-1.0) after the policy change (P = 0.038); the average (95% CI) total costs of all-cause overnight stays in an inpatient setting were $8,907 ($5,532-$14,340) before the policy change and $7,449 ($4,658-$11,910) after the policy change (P = 0.600). For the first 60 days after referral, the propensity-weighted estimated mean (95% CI) number of all-cause nights in an inpatient setting across all patients was 1.6 (1.1-2.4) before the policy change and 1.1 (0.7-1.7) after the policy change (P = 0.219); the average (95% CI) total costs of all-cause overnight stays in an inpatient setting were $10,614 ($7,592-$14,838) before the policy change and $8,131 ($5,822-$11,356) after the policy change (P = 0.275).

Conclusion: The increased availability of NOACs coupled with a pharmacist-led outpatient anticoagulation clinic may reduce length of hospital stay and decrease health care expenditures for patients with DVT.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 16-M

Poster Title: Real-world dosing patterns of FDA-approved medications for fibromyalgia

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Purpose: This study assessed real-world dosing patterns of the three FDA-approved medications for fibromyalgia: pregabalin, duloxetine and milnacipran.

Methods: This retrospective cohort study used Quintiles' electronic medical record data linked to administrative claims from Truven's MarketScan database between 1/1/05 - 12/31/15. Eligible patients had a fibromyalgia diagnosis (ICD-9-CM 729.1), received a new prescription for one or more of the three FDA-approved medications between 1/1/06 - 12/31/14 (allowing for one-year baseline and follow-up periods), were at least 18 years of age, and continuously enrolled in the health plan during the study period. Patients were classified into pregabalin, duloxetine, or milnacipran cohorts based on their first observed (index) fibromyalgia medication. Patients who had cancer during baseline or who received two or more FDA approved medications for fibromyalgia at index were excluded. However, patients were allowed to have received an additional FDA approved medication during baseline or follow-up. Starting, final, and maximum doses of the index medication (defined as calculated daily doses of the first prescription, last prescription, and prescription of the highest dose, respectively) were summarized and compared to US Prescribing Information dosing recommendations (starting and maintenance doses of 150mg and 300mg to 450 mg/day pregabalin, 30mg and 30mg to 60 mg/day duloxetine, and 12.5mg and 100mg to 200 mg/day milnacipran, respectively).

Results: 2,650 patients met criteria with 1,043 receiving pregabalin, 1,281 receiving duloxetine, and 326 receiving milnacipran at index. Mean(SD) age of patients was 50(12), 50(11), and 49(11) years($p=0.31$) and 87, 89, and 95 percent($p < 0.05$) were female in the pregabalin, duloxetine, and milnacipran cohorts, respectively. Mean baseline Charlson comorbidity score

was comparable across cohorts; however, there were significant differences in the use of concomitant medications including analgesics, short-acting opioids, and SNRIs. Mean(SD) starting, final, and maximum doses were 176.2(220.1), 221.7(291.3), 241.6(309.6) mg/day for pregabalin, 55.6(64.4), 64.7(73.4), 68.0(73.4) mg/day for duloxetine, and 104.8(98.5), 108.7(85.2), 118.5(137.8) mg/day for milnacipran. About 35 percent of pregabalin patients received starting dose lower than recommended, compared to 7 percent of duloxetine and 17 percent of milnacipran patients. Only 30 percent of pregabalin patients were prescribed the recommended maintenance dose at any point during follow-up, compared to 72 percent for duloxetine and 81 percent for milnacipran. The average duration of individual maximum dose as a percentage of total time on index medication was shortest for pregabalin (60 percent), followed by duloxetine (75 percent) and milnacipran (78 percent)($p < 0.0001$). Total duration of treatment was shortest in pregabalin and milnacipran with 166.6(141.3) and 166.8(143.2) days, and longest in duloxetine with 205.4(146.3) days($p < 0.001$).

Conclusion: Pregabalin patients were most likely to be prescribed starting doses lower than label-recommended doses and least likely to be prescribed the recommended dose at any point during follow-up compared to duloxetine and milnacipran patients. Furthermore, pregabalin patients had shorter durations of overall therapy and individual maximum dose even when compared to milnacipran, which had the same total duration but a higher percentage of maximum recommended dose and time on individual dose. Future studies should investigate reasons behind and implications of the differences in dosing and duration, including efficacy, patient symptoms, concomitant medications, and side effects associated with higher doses.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 17-M

Poster Title: Updated pneumococcal vaccination guidelines: a review of inpatients aged sixty-five (65) years and older at an acute rehabilitation hospital

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Purpose: Magee Rehabilitation Hospital is a subacute inpatient rehabilitation facility, specializing in the rehabilitation of the following patient populations: spinal cord injury, brain injury, stroke, and amputation. The facility has a maximum capacity of 74 patients, with their duration of stay ranging from two to six weeks. In August 2014, the Advisory Committee on Immunization Practices recommended the use of 13-valent pneumococcal conjugate vaccine among adults aged 65 years and older. Recognizing the value of pneumococcal vaccine administration in preventing detrimental health outcomes associated with pneumococcal infection, a review to assess for the adherence and barriers to these guidelines was conducted.

Methods: Over the course of six weeks, pharmacy student interns employed by the department of pharmacy assessed the past medical history of 28 patients to determine whether or not they received the vaccine in congruence with the new guidelines. Patients were screened and evaluated based upon the current Center for Disease Control's pneumococcal vaccine eligibility criteria and application of the updated guidance. Students utilized the following methods: surveillance software to identify eligible patients, hospital documentation transfer, patient interview, and primary care physician documentation. Students involved evaluated documentation in the following sources: transfer records from referring institutions, patient interviews and calls to primary care physicians. Under the supervision of a pharmacist, data were evaluated to compliance with the CDC Guidelines and gaps were identified. A total of 28 patients were evaluated during the six-week pilot study. Patients included were deidentified following data analysis. This pilot study was submitted through the institutional review board and deemed exempt.

Results: Using the various methods, it was concluded that 18 of the 28 patients had received the vaccine in accordance with the new guidelines. Seven successful administrations of pneumococcal vaccine were found through the evaluation of hospital transfer forms. The forms of administration were unspecified. Five successful documentations of pneumococcal vaccination were found through patient interview, and this was confirmed through contact with the primary care physician. Eighteen primary care physician offices were contacted throughout the duration of the review. From these communications our findings are as follows: 6 instances of patients not having received the vaccine; 13-valent pneumococcal conjugate vaccine administered to 5 patients and 23-valent pneumococcal conjugate vaccine administered to 8 patients. In 4 instances, pneumococcal vaccine history was unable to be determined. The evaluation included quantitating time spent in obtaining this information. Over the 6 week study period, 18 hours of pharmacy student intern time was required to compile these data of 28 patients. Pharmacist oversight time was not documented.

Conclusion: A report was prepared and presented to various Committees and Leadership within the institution to develop an action plan to further operationalize and streamline this assessment process.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 18-M

Poster Title: Evaluation of clinical safety outcomes associated with conversion from brand to generic tacrolimus in transplant recipients at VA San Diego Healthcare System

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Purpose: Generic medications are typically more cost effective compared to brand medications. As a cost savings initiative, VA San Diego converted patients from brand to generic tacrolimus by Mylan in March 2016. At the time, pharmacy manually contacted every patient via phone with instructions to go to lab 1 week after initiating generic tacrolimus, which created additional pharmacists workload and added lab costs. Furthermore, there were no studies evaluating generic tacrolimus by Mylan. Thus, this evaluation is aimed to determine the safety and efficacy of converting patients from brand tacrolimus to generic tacrolimus by Mylan.

Methods: Data (demographics, organ transplant, FK levels) was collected using SQL data management system for patients that were part of the conversion to generic tacrolimus in March 2016. Patients were included in the brand tacrolimus (control) group if they were deemed stable by their provider within 6 months of their first fill in 2015. They were also included in the generic (experimental) group if they were converted to generic tacrolimus no later than June 2016. Patients in both groups were required to have documented FK levels (tacrolimus troughs) and unambiguous tacrolimus dosing regimen. Patients were excluded from the study if there was no documented FK levels drawn or if their documented tacrolimus dosing was ambiguous during the 6 months study time frame. A chart review was conducted to identify FK goals and the date in which the patient initiated generic tacrolimus. Patients were evaluated for hospitalizations, acute rejections, and number of dose changes required within a 6 months time frame.

Results: Of the 103 patients converted from brand to generic tacrolimus in March 2016, 70 patients were included in the control group and 79 patients were included in the experimental

group. Majority of patients included were kidney or liver transplant recipients. Of the 70 patients evaluated in the control group, 19 (27%) required dose adjustments with 9 patients requiring a dose increase. Of the 79 patients in the experimental group, 24 (30%) required dose adjustments, with 11 patients requiring a dose increase. Among patients with documented FK goals, 42 out of 66 patients (64%) in the control group versus 34 out of 72 patients (47%) in the experimental group had FK levels within goal. Furthermore, there were 18 (25%) hospitalizations and 2 (3%) documented acute rejections in control group versus 16 (20%) hospitalizations and 3 (4%) documented acute rejections in the experimental group.

Conclusion: From this chart review, a larger proportion of patients in the experimental group required dose titration. However, there were similar proportions of acute rejections and a smaller proportion of hospitalizations . This suggests that generic tacrolimus may be similar in safety compared to brand tacrolimus. Overall, generic tacrolimus by Mylan did not appear to adversely affect graft function or increase rates of hospitalizations/acute rejection, which suggests that it is as effective as brand tacrolimus. However, the long term effects of patients converted to generic tacrolimus is still unknown. Routine monitoring following conversion is still recommended at this time.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 19-M

Poster Title: Study of Drug-Drug Interactions Associated with Potential QT Prolongation of Ambulatory Patients in Taiwan

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Purpose: Drug-drug interaction (DDI) may increase or declinepharmacological effects and potential toxicity. In addition, Dis resulting in QT prolongation (QTP) may be life-threatening. The aims of this study were to evaluate the incidence of QTP DDIs and associated factors among outpatients in Taiwan.

Methods: We used Longitudinal Health Insurance Database 2005 (LHID2005), derived from the National Health Insurance Research Database to collect data from 1998 to 2010. Two hundred and one pairs of grade 1 DDIs with potential risk of QTP defined by Drug Interaction FactsTM were included. The annual incidences of DDI were analyzed. Because cisapride was withdrawn since 2004, we additionally analyzed the prescription data removing DDI pairs involving cisapride to evaluate the annual DDI incidence within the same prescriptions and among different prescriptions, and also compared DDI incidence of different medical institutions or specialties. We further analyzed the associated factors of QTP DDI prescription including numbers of prescribed items, characteristics of patients, characteristics of physicians, and characteristics of medical institutions by using claims data in 2010.

Results: There were 24,584 patients with 81,339 times of QTP DDIs from 1998 to 2010. The incidence trend showed a significant decrease. After excluding 38 DDI pairs involving cisapride, the rest 38,552 events only revealed a slightly downward trend of DDI incidence during 13 years. The overall incidence of QTP DDI across prescriptions was 1.6 times higher than that incidence within the same prescriptions. The most frequently prescribed DDI pair was chlorpromazine-propranolol among both "within" and "across" prescriptions data. In the analysis of specialties, the psychiatrists prescribed the highest DDI rate (within: 8.81-28.03 ; across: 10.61-27.64 events/1000Rx), followed by infection specialties (within: 2.38-12.13 ;

across: 4.95-15.48 events/1000Rx). Several factors were significantly associated with QTP DDI prescriptions, including prescriptions with more drugs (incidences of 4-6 and >6 items were 6.55 and 17.84 times higher than 2-3 items), patients with more visits per year (incidences of ?-24 visits within Rx and across Rx were 2.52 and 6.51 higher than =12 visits), patients with visiting to the regional hospitals, district hospitals, psychiatry departments and infection departments.

Conclusion: The trend of QTP DDI from 1998 to 2010 decreased slightly after excluding prescriptions involving cisapride. This phenomenon needs urgent improvement. Our results suggest that the Bureau of National Health Insurance may establish reimbursement restriction regarding the absolute contraindicated DDIs with life threatening QTP side effects to eliminate those inappropriate prescriptions and ensure patients' medication safety.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 20-M

Poster Title: Icatibant: medication use evaluation

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Purpose: Icatibant is approved for acute attacks of hereditary angioedema (HAE). It is also used off-label for angiotensin converting enzyme inhibitor (ACE-I) induced angioedema. Icatibant National Criteria for Use (CFU) is currently approved for HAE however, due to limited data, it does not address icatibant use in ACE-I induced angioedema. Icatibant requires a non-formulary consult and a pharmacist review before use. Since there is no CFU, every pharmacist reviews icatibant inconsistently; thus the objective of this evaluation is to assess the use of icatibant in ACE-I induced angioedema.

Methods: Data was pulled for all patients who received icatibant therapy from 9/2015-9/2016. A chart review was conducted to examine patient's symptoms, concurrent standard angioedema therapy, ordering service, allergy service consult, number of doses given and the resolution of symptoms after one dose, complete resolution of symptoms, history of ACE-I use, and lab testing of C1 inhibitor protein and serum complement factor 4 (C4).

Results: Of the ten patients, six (60%) had facial edema, two (20%) had tongue edema, one (10%) had facial and tongue edema, and one (10%) had laryngeal edema. All patients received standard therapy of antihistamines and/or glucocorticoids. Icatibant was ordered by the following services: Emergency Department (50%), Intensive Care Unit (30%), Direct Observation Unit (10%), and Three North (10%). Allergy Service was consulted for 70% of the cases. Out of ten patients, one patient received two doses and nine patients received one dose. Patients that received one dose, 89% had a complete resolution of symptoms. The patient that did not achieve resolution was later diagnosed with squamous cell carcinoma base of tongue, which could have contributed to the symptoms. Patient that received two doses had a complete resolution of symptoms after the second dose. Nine (90%) patients had a history of ACE-I use and all patients had an unknown HAE history. Six (60%) patients that were tested for C1 inhibitor protein and C4 were negative for HAE. Of the four patients who were not tested, two had a recent ACE-I initiation resulting in ACE-I induced angioedema, one was on ACE-I for several years and one had previous history of ACE-I use.

Conclusion: Despite successful resolution of symptoms, each pharmacist approved the consult inconsistently. In order to allow standardization of care, local criteria should be developed to ensure appropriate use. Based on the results, pharmacist should assess the following parameter prior to approval: severity of symptoms (i.e. intubation, airway restriction), initiation of standard therapy before icatibant use (depending on severity), history of ACE-I use, history of HAE, and restrict to Allergy/Immunology or ER. This will improve the consistency in reviewing consults.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 21-M

Poster Title: Evaluation of inpatient glycemic control in patients managed on concentrated insulin products

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Purpose: The Food and Drug Administration recently approved new concentrated insulin products (NCIP) such as insulin degludec, insulin glargine recombinant U300, and insulin regular concentrated U500. Patients are potentially at risk for medication errors when converted to inpatient formulary products from their home NCIP regimen. In addition, patients with diet changes or fluctuating renal function are especially difficult to manage. The purpose of this medication review was to evaluate the incidence of glycemic events in hospitalized patients managed outpatient on NCIP versus insulin glargine, as well as to assess prescribing patterns and their alignment with current package insert and guideline recommendations.

Methods: A retrospective chart review was performed in September 2016 of all adult patients admitted on a home NCIP within Yale New Haven Health since 2015. Patients admitted on a home NCIP were matched to patients on home insulin glargine based on admission year and total daily basal dose. Exclusion criteria included insulin pumps, initiation of an insulin infusion (except for diabetic ketoacidosis), unknown insulin regimen, refusal of insulin during hospitalization, and bariatric surgery. Patients were evaluated for proper insulin transition by hospital day two and rates of glycemic events. A hyperglycemic event was defined as blood glucose greater than or equal to 300mg/dL, a hypoglycemic event was defined as blood glucose less than or equal to 70mg/dL, and a glycemic event was defined as either. Comparisons between NCIP and insulin glargine patients were made using t-tests for continuous variables and chi-square tests for categorical variables. When cell counts were small, the Fisher's exact test was used instead of chi-square. Multivariate logistic regression was used to measure the effect of NCIP use on study outcomes, controlling for age, gender, and Charlson Comorbidity Index. Logistic regression was used to assess the effect of various baseline characteristics on

study outcomes. All analyses were performed in SAS version 9.4. As this was a retrospective medication use evaluation, it did not require approval from our institutional review board.

Results: Fifty-six patients were identified. Twenty-eight were managed outpatient on NCIP and twenty-eight were managed on insulin glargine. No significant differences in demographic or baseline characteristics were identified between both groups. Twenty out of twenty-eight NCIP patients were dosed too high, while only two glargine patients were dosed too high per our algorithm. In an unadjusted model, patients dosed above the recommended dose had lower odds of having a glycemic event (OR = 0.18, 95 percent CI: 0.05 to 0.64). After adjusting for age, gender, Charlson and NCIP, this became non-significant (OR = 0.19, 95 percent CI: 0.04 to 1.05). Similarly, patients on NCIP had significantly lower odds of glycemic events (OR = 0.31, 95 percent CI: 0.10 to 0.92), but after adjustment for age, gender, Charlson and dose this became non-significant (OR = 0.26, 95 percent CI: 0.04 to 1.66). Having a blood glucose greater than 300 on admission was associated with an increased risk of hyperglycemia (OR = 6.39, 95 percent CI: 1.28 to 31.84).

Conclusion: Although our initial results indicated that patients on NCIP had fewer glycemic events than patients on glargine, this appeared to be largely driven by the fact that patients on an outpatient NCIP were less likely to be converted to inpatient insulin glargine according to our algorithm, and more likely to be overdosed. Interestingly, patients who were overdosed had significantly fewer glycemic events than patients who were underdosed, suggesting that our algorithm may be too conservative for some patients. Future research is needed to better evaluate impact of outpatient to inpatient transitioning of patients on NCIP.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 22-M

Poster Title: Impact of Plecanatide on Quality of Life for Patients with Chronic Idiopathic Constipation: Analysis of PAC-SYM and PAC-QOL from Two Randomized Phase III Clinical Trials

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Purpose: Health-related quality of life (HRQOL) is significantly reduced for patients who suffer from chronic idiopathic constipation (CIC). Plecanatide, a 16-amino acid analog of the human gastrointestinal peptide uroguanylin, activates guanylate cyclase-C receptors in the small intestine in a pH-sensitive manner to induce fluid secretion, contributing to normal bowel function. This analysis investigates whether plecanatide improved HRQOL in patients with CIC from two large-scale, randomized, double-blind, placebo-controlled, phase III studies evaluating the efficacy and safety of plecanatide (ClinicalTrials.gov: NCT01982240, NCT0212247).

Methods: Patients who met modified Rome III criteria for CIC were randomized to placebo, plecanatide 3mg, or plecanatide 6mg daily for 12 weeks. A total of 2683 patients with CIC were included in the combined phase III intention-to-treat population. Baseline characteristics were comparable between groups and across the two studies. The primary endpoint for both trials was the percentage of durable overall complete spontaneous bowel movement (CSBM) responders (?-3 CSBMs plus increase of ?-1 CSBM over baseline in the same week) for ?-9 of the 12 treatment weeks, including ?-3 of the last 4 weeks. HRQOL was evaluated using two questionnaires: Patient Assessment of Constipation?"Quality of Life (PAC-QOL) and Patient Assessment of Constipation?"Symptoms (PAC-SYM). The PAC-QOL evaluated patients' perception of their HRQOL with constipation and rated patients' worries and concerns, physical discomfort, psychosocial discomfort, satisfaction, and overall effects on HRQOL on a scale of 0 ("not at all" or "none of the time") to 4 ("extremely" or "all of the time"). The PAC-SYM measured patients' constipation symptom experience and symptom severity over time and rated specific abdominal, rectal, and stool symptoms of constipation on a scale of 0 ("absent") to 4 ("very severe"). Reductions in these scores indicate improvement. Efficacy analyses evaluated each plecanatide dose vs placebo.

Results: Pooled efficacy demonstrated a significantly greater percentage of durable overall CSBM responders in each of the plecanatide groups (3mg, 20.5%, P < 0.001; 6mg, 19.8%, P < 0.001) when compared to the placebo group (11.5%). A significant improvement in PAC-QOL was observed for plecanatide 3mg and 6mg vs placebo at weeks 4, 8, and 12, in both studies. At week 12, the least squares (LS) mean changes from baseline for placebo, 3mg, and 6mg were ?'0.73, ?'0.99 (difference from placebo [?], ?'0.25; P < 0.001), and ?'1.01 (??'0.28; P < 0.001), respectively [Study 1], and ?'0.92, ?'1.13 (??'0.20; P < 0.001), and ?'1.11 (??'0.19; P < 0.001), respectively [Study 2]. PAC-SYM was also significantly improved for plecanatide 3mg and 6mg vs placebo at weeks 4, 8, and 12, in both studies. At week 12, the LS mean changes from baseline for placebo, 3mg, and 6mg were ?'0.69, ?'0.90 (??'0.22; P < 0.001), and ?'0.91 (??'0.23; P < 0.001), respectively [Study 1], and ?'0.94, ?'1.12 (??'0.18; P=0.002), and ?'1.10 (??'0.15; P=0.009), respectively [Study 2]. The most common adverse event (AE) was diarrhea (3mg, 4.6%; 6mg, 5.1%; placebo, 1.3%). Discontinuation rates due to AEs were 4.1% (3mg), 4.5% (6mg), and 2.2% (placebo), with low discontinuation due to diarrhea (3mg, 1.9%; 6mg, 1.8%; placebo, 0.4%).

Conclusion: Patients who received plecanatide 3mg and 6mg had a statistically significant improvement in bowel movement frequency (durable overall CSBM responders) compared to patients who received placebo. HRQOL, as measured by the PAC-QOL and PAC-SYM, was improved at all time points for patients who were treated with plecanatide (~1-point improvement). Plecanatide treatment was associated with a low incidence of diarrhea and other AEs. These data suggest that plecanatide is a useful treatment option in the management of symptoms and HRQOL in patients with CIC.

Submission Category: General Clinical Practice

Session-Board Number: 23-M

Poster Title: BURDEN-CIC (Better Understanding and Recognition of the Disconnects, Experiences, and Needs of Patients with Chronic Idiopathic Constipation) Study: A Severity Analysis

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Purpose: Chronic idiopathic constipation (CIC) is a common functional gastrointestinal disorder with prevalence ranging from 2% to 27% in adults, averaging 14%, and is more prevalent in women and with increasing age. Patients with CIC often report dissatisfaction with traditional treatment options and over-the-counter (OTC) laxatives. The BURDEN-CIC study was conducted to assess the impact of disease severity on quality of life, activities of daily living, and treatment satisfaction in patients with CIC.

Methods: BURDEN-CIC was a 45-minute, 68-question, IRB-approved online survey that utilized the Knowledge Network Panel to identify patients suffering from CIC. Patients with a formal diagnosis of CIC or who experienced CIC (according to Rome IV criteria) were eligible, resulting in over 1,100 CIC patients completing the survey (mean age, 49 years; 69.1% female). A subanalysis of patients with more severe CIC (defined as having an impact on productivity, an impact on activities of daily living, an emergency room visit, or a need for a prescription CIC treatment) was also conducted. Of the entire CIC patient population, 62.1% of patients were classified as having severe CIC: 52.4% of CIC patients indicated symptoms impacted productivity (?-1 day/month), 42.4% indicated symptoms interfered with personal activities (?-1 day/month), 14.5% had ?-1 emergency room visit in the past year, and 14.0% were currently using a prescription CIC medication. This analysis focused on the impact of CIC on quality of life and activities of daily living.

Results: Most patients had used (62%) or were using (53%) OTC treatments for their CIC. Satisfaction with current treatments (OTC or prescription) was low, with only 44.6% of all

patients and 42.6% of severe CIC patients feeling satisfied, and with only 13.9% of current prescription users expressing that their treatment relieved their CIC symptoms. In the evaluation of the bothersomeness of CIC symptoms, a large percentage of patients indicated that CIC symptoms have a bothersome, very bothersome, or extremely bothersome impact on quality of life when analyzed for all CIC patients (30.5%, 20.8%, 8.3%, respectively), which was more pronounced in severe CIC patients (35.2%, 29.2%, 11.2%, respectively). Of the total CIC population, 18.6% of patients indicated that their constipation symptoms prevented them from enjoying activities of daily living, in comparison with 27.1% of severe CIC patients. When asked how many days per month their CIC symptoms interfered with productivity or interfered with personal activity, the total CIC population reported an average of 4.8 and 3.5 days, respectively. Severe CIC patients reported an average of 7.3 and 5.4 days, respectively. Of patients indicating that symptoms interfered with productivity, constipation resulted in missing work/school for an average of 2.1 days/month.

Conclusion: Patients with CIC have a reduced quality of life, with significant impairments in treatment satisfaction and activities of daily living that were directly correlated with the severity of CIC symptoms. This study underscores the notion that a substantial unmet need exists for treatments to effectively manage the symptoms of CIC.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 24-M

Poster Title: Impact of a pharmacy-based transitions of care clinic on the continuum of care following hospitalization: Bridging the inpatient-to-outpatient appointment gap

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Purpose: Post-discharge follow-up remains a barrier to successful care transitions after an acute hospitalization. Lack of follow-up care may result from numerous factors including not having a primary care physician (PCP), limited appointment availability with existing PCP, or lack of patient motivation/awareness to schedule an appointment. This project was designed to offer a pharmacist visit to patients with medication adherence barriers and to provide pharmacists a proactive approach to triaging patients for medication management.

Methods: The pharmacy department developed a process for patient identification in the form of a pharmacy consult with the IT department. Pharmacy technicians gathering medication histories in the emergency department (ED) are educated to use this consult to notify Transitions of Care (TOC) pharmacists of patient admissions. The four-question Morisky Medication Adherence Scale (MMAS-4) was added in the medication history interview to assess adherence. The TOC pharmacist used an inclusion criteria checklist to determine the type of follow-up appointment qualifying patients would benefit most form ?" a PCP visit, a medication management visit with a pharmacist, or a joint visit with both providers. With remote access to the outpatient electronic heath record (EHR), TOC pharmacists are able to schedule an appointment for patients and provide that information to the patient prior discharge.

Results: Preliminary results showed an increased number of patients identified and in need of medication management services. The MMAS-4 score provides pharmacists with a quantitative measure to monitor adherence if the patient is enrolled in the weekly comprehensive medication management clinic. Physicians have expressed satisfaction with the pharmacist-led clinics and have referred additional patients to the clinics.

Conclusion: The results of this project will be used to develop proactive approaches to identify patients early in admission that may benefit from pharmacist services.

2017 Summer Meetings Poster Abstracts

Submission Category: I.V. Therapy/Infusion Devices/ Home Care

Session-Board Number: 25-M

Poster Title: Every infusion counts: A more complete measure of infusion safety

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Purpose: Infusion safety is typically measured by an organization's smart pump drug library compliance rate. Although recommendations for consistent use of the drug library persist, there are no industry performance standards for drug library compliance; each facility must set its own success metric. This study looks at the number of infusions left unprotected at different compliance rate levels to help hospitals established a more informed compliance rate target.

Methods: Infusion pump data for 18 hospitals, ranging from 287 pumps to 3,417 pumps were analyzed to identify drug library compliance rates for the time period of October 2014 to July 2015. A total of 21,454 infusion pumps were analyzed with a total of 12,862,416 infusions. Further analysis on the correlation between drug library compliance rates and hospital size (based on number of pumps) and between drug library compliance rates and number of infusions delivered per hospital were performed. In addition, comparisons of drug library compliance rates from different hospitals were conducted to understand the impact on the number of infusions that may be left unprotected.

Results: Results indicated an overall drug library compliance rate with a mean of 96.9%, and a median of 97.8%. The minimum was 84% and the maximum at 99.2%, with a standard deviation of 3.4%. The correlation between drug library compliance rates and hospital pump size revealed that hospitals with 717 pumps to 3417 pumps had a compliance rate of 97.4%, whereas hospitals with 287 to 639 pumps had a compliance rate of 98.1%. An anomaly was observed for one hospital with 688 pumps that recorded a compliance rate of 84%. As a result, no correlation was observed between drug library compliance rates and hospital size. Similar results were seen with analysis on the correlation of drug library compliance rates and the number of infusions delivered per hospital. Additional analyses revealed significant differences in the number of infusions unprotected when looking at individual hospitals, their drug library compliance rates and the number of infusions delivered. Data indicated a hospital with 1226 pumps and 872,446 infusions delivered with a drug library compliance rate of 97.1% resulted in

25,073 infusions unprotected. A comparison of a hospital with 3417 pumps, 1,690,012 infusions delivered and a compliance rate of 98.7% resulted in 21,500 infusions unprotected.

Conclusion: Infusion safety is best measured by the drug library compliance rate and number of unprotected infusions. If the hospital with a drug library compliance of 97.1% was improved to 98.7%, the number of unprotected infusions decreases to 11,341, representing a greater than 50% decrease in the number of unprotected infusions. Improving drug library compliance even by 1% to 2% exponentially decreases the number of unprotected infusions. Establishing a compliance rate target is best achieved by looking at both the percentage and number of unprotected infusions. Hospitals should consider a compliance rate target that provides the least number of unprotected infusions.

2017 Summer Meetings Poster Abstracts

Submission Category: I.V. Therapy/Infusion Devices/ Home Care

Session-Board Number: 26-M

Poster Title: Optimization of smart pump use in an ambulatory care oncology infusion center

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Purpose: Smart pumps are valuable tools used by hospitals to communicate infusion dosage and administration limitations to ensure patient safety. They can also provide data for continuous quality improvement efforts. Despite technology advancement, programming and administration errors still occur. Analysis of an oncology infusion area showed a higher percentage of infusions that did not utilize medication specific smart pump technology. In addition, a number of alerts were identified to not be clinically significant. A process improvement project was implemented to improve the overall safety of oncology infusions by optimizing the use of smart pumps.

Methods: A smart pump evaluation was performed in the oncology infusion center at UMass Memorial Medical Center in Worcester, MA. The infusion center serves primarily oncology patients but also serves non-oncology patients. An institutional review board evaluation was not required. To identify the correct infusions distinct from other parts of the hospital, all infusion center nurses were educated to enter the same code as a patient identifier when programming infusions into the smart pump. Initial data was collected from November 21st, 2017 to December 21st, 2017. Reports were created through CareFusion Knowledge Portal. Reports were analyzed for medication alerts that were overridden and deemed to not be clinically significant and the frequency of infusions not utilizing the smart pump formulary (basic infusions). Process mapping was also performed by direct observation and communication with nurses. Data collected included alerts involving medication limits that were overridden and the number of basic infusions. Updates were made to the smart pump library at timed intervals and nursing staff was educated. A second data collection was performed from February 1st, 2017 to March 1st, 2017.

Results: From November 21st, 2017 to December 20th, 2017 there were a total of 3,437 infusions in the oncology infusion center. Of this total, 1,511 infusions were programmed in the

smart pump using medication specific entries and involved 276 medication specific override alerts (18.1%). There were 1,926 basic infusions (56%). The smart pump library was updated to include 4 medications which were identified as missing on January 4th, 2017. From February 1st, 2017 to March 1st, 2017 there were a total of 2,830 infusions. Of this total, 1,396 infusions were programmed in the smart pump using medication specific entries and involved 257 medication specific override alerts (18.1%). There were 1,434 basic infusions (51%). After analyzing overrides and basic infusions, an additional 2 medications were added and administration limits were updated on 3 medications in a smart pump library update on March 14th, 2017. An additional 9 medications were identified as needing updates in a future smart pump update.

Conclusion: The goal of optimizing the use of smart pumps is to ensure that there are medication specific entries with appropriate administration limits to reduce alert fatigue and maintain patient safety. By engaging front line staff and analyzing smart pump reports not only were new medications added to the smart pump library but current medications were updated. In a short period of time, there was a reduction seen with the basic infusion rates in the oncology infusion center. This type of continuous quality improvement project is recommended to be implemented in all areas that utilize smart pump technology.

Submission Category: Infectious Diseases

Session-Board Number: 27-M

Poster Title: Azithromycin use in upper respiratory infection patients: A study of antibiotic prescribing trends at a federally qualified health center (FQHC) in southern Ohio

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Purpose: Azithromycin continues to be prescribed at high rates for acute upper respiratory tract infections (URI) in clinical practice. Current guidelines recommend that delayed antibiotic prescribing methods be used for these infections, as they are largely viral in nature. Concerns for prescribing subsequent antibiotics after an initial regimen of azithromycin arise from the post-antibiotic effect. This study aims to examine the prescribing trends of antibiotics among patients presenting with acute URI in order to determine adherence to prescribing guidelines, and to affirm the importance of pharmacists' role in patient counseling and medication review as a means of antibiotic stewardship.

Methods: This retrospective observational study utilized chart reviews to determine rates of antibiotic prescribing. Data was collected from FQHCs in southern Ohio using electronic health records from 2012 to 2015. IRB approval was obtained in March 2015 with site approval being obtained in May 2015; data collection began in October 2015. The study sample included subjects 21 years and older who presented with ICD-9 codes for acute URI. Subjects who were pregnant, immunocompromised, or presented with chronic respiratory conditions or acute exacerbations of those conditions were excluded from data collection. Patient records were compiled into a report based on the defined inclusion and exclusion criteria. Chart review was performed for a mean of 153 subjects per year. Data obtained from the charts included: age, gender, race, date of visit, ICD-9 code, presence or absence of an antibiotic, presence of a second antibiotic, and dosing of antibiotic if present. Second antibiotic prescribing was defined by an antibiotic prescribed within 2 weeks of an initial antibiotic. Data analysis was conducted using IBM SPSS version 24.

Results: 615 patients were identified for evaluation who were seen at the FQHC from the years 2012 to 2015. The mean age of these patients was 50 years old with the majority being female (482 or 78%). Of these patients, 335 (54%) received an antibiotic upon initial presentation, with azithromycin being the most commonly prescribed. A prescription for azithromycin was given to 127 patients, which constituted 21% of all patients studied or 38% of patients who received an initial antibiotic therapy upon initial presentation. Among those who received any initial antibiotic, 9 patients (1.5%) received a second antibiotic during a subsequent visit within 2 weeks of initial prescription. The ICD-9 code for acute bronchitis was the most reported code among all patients (186 or 30%). A total of 19 different regimens were identified in this patient population.

Conclusion: Despite the concern for subsequent antibiotic prescribing after an initial azithromycin prescription, a low percentage of patients diagnosed with acute URI returned for a second antibiotic within the 14-day window. While this finding is encouraging, this study found that antibiotics, as a whole, were prescribed at a rate above what is recommended by current guidelines. Inappropriate antibiotic prescribing may be a substantial contributing factor in the global antibiotic resistance crisis that currently faces the healthcare system. These findings confirm the significant role that pharmacists have to combat antibiotic resistance by providing education in an effort to decrease inappropriate antibiotic prescribing.

2017 Summer Meetings Poster Abstracts

Submission Category: Pharmacokinetics

Session-Board Number: 28-M

Poster Title: Comparative bioavailability of hydroxyprogesterone caproate administered via intramuscular injection or subcutaneous auto-injector in healthy postmenopausal women

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Purpose: Hydroxyprogesterone caproate injection is a synthetic progestin indicated to reduce the risk of preterm birth in women with a singleton pregnancy who have a history of a singleton spontaneous preterm birth. Currently, hydroxyprogesterone caproate (HPC) is administered intramuscularly (IM) with a 21 G needle in the gluteus maximus. An alternative that utilized a pre-filled syringe with an auto-injector, smaller needle (27 G), and subcutaneous (SC) administration in the back of the upper arm was investigated. This study compared the pharmacokinetic (PK) profile of HPC administered by both methods.

Methods: Subjects included healthy postmenopausal (naturally or surgically) women between ages 50 and 75 years, with a body mass index of ?-18kg/m2. Postmenopausal was defined as follicle-stimulating hormone levels >40 mIU/mL and one of the following: at least 1 year natural spontaneous amenorrhea; at least 6 weeks post-surgical bilateral oophorectomy, with or without hysterectomy; status post-hysterectomy (without oophorectomy). All eligible participants were randomized to receive either a single injection of 1.1 mL (275 mg total dose) of preservative-free HPC solution administered via SC injection using an auto-injector in the back of the upper arm, or 1 mL (250 mg total dose) of preservative-free HPC solution administered via IM injection in the upper outer quadrant of the gluteus maximus. Blood samples were collected through 1008 hours (42 days) after injection. The primary outcome measure was the maximum whole blood concentration (Cmax) and areas under the curve (AUC) to the last time with a concentration ?- the lower limit of quantification (LLOQ) (AUC0-t) and to infinity (AUC0-inf). Secondary outcome measures included the time to Cmax (Tmax), elimination rate constant (?z), half-life (t), and injection site reactions captured as any adverse event (AE) occurring at the injection site or associated with the injection.

Results: The primary PK population consisted of 45 participants treated with HPC delivered SC by an auto-injector and 45 who received IM injections of HPC. The geometric mean whole

blood concentrations of HPC were comparable after the 1.1 mL (275 mg) SC dose and IM administration of 1.0 mL (250 mg). While the SC treatment had a higher geometric mean Cmax (7.88 ng/mL vs. 6.91 ng/mL), the median values for Tmax were essentially the same (48.1 hr vs. 49.7 hr) and the AUCs met criteria for bioequivalence. The least square geometric mean ratios (LSGMRs) for AUC(0-168), AUC(0-t), and AUC(inf) were 102.89%, 110.25%, and 113.51%, respectively, with 90% CIs for all 3 AUCs within 80.0% to 125.0%, demonstrating equivalent exposure. The LSGMR for Cmax was 113.95% with a 90% CI of 91.94% to 141.23%, somewhat above the 80.00% to 125.00% equivalence window but with substantial overlap of individual values between treatments. The geometric mean t of HPC was 212 hr (8.8 days) for the SC treatment and 188 hr (7.7 days) for IM administration. The most common treatment emergent adverse event was injection site pain (37.3%-SC group and 8.2%-IM group) described as mild (85%) to moderate (15%) in nature.

Conclusion: Administration of HPC by SC injection of 1.1 mL (275 mg) via auto-injector results in comparable exposure to IM injection of 1.0 mL (250 mg). The extent of absorption was not different, as demonstrated by bioequivalence for AUC(0-168), AUC(0-t), and AUC(inf). The geometric mean Cmax was somewhat higher for the SC than IM, but with substantial overlap of individual values between treatments.

2017 Summer Meetings Poster Abstracts

Submission Category: Pharmacokinetics

Session-Board Number: 29-M

Poster Title: Simultaneous LC-MS analysis of plasma concentrations of sildenafil, tadalafil, bosentan, ambrisentan and macitentan in patients with pulmonary arterial hypertension

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Purpose: Phosphodiesterase-5 (PDE-5) inhibitors and endothelin receptor antagonists (ERAs) are standard therapies for pulmonary arterial hypertension (PAH). Because inter-individual variability of PDE-5 inhibitor and ERA pharmacokinetics is remarkably large, therapeutic drug monitoring (TDM) can be useful to improve the likelihood of the desired therapeutic and safety outcomes. This study aimed to develop a LC-MS method to determine the concentrations of five PAH drugs (PDE-5 inhibitors: sildenafil and tadalafil, ERAs: bosentan, macitentan, and ambrisentan) from plasma samples using a simple process followed by a single mass spectrometric run, and to validate this approach through pharmacokinetic analyses in patients.

Methods: A solid extraction method was used for sample preparation of the drugs (sildenafil, tadalafil, bosentan, ambrisentan, and macitentan) from human plasma. The plasma samples (300 L) were spiked with an internal standard (homo-sildenafil), and mixed with 0.1% formic acid. After centrifugation, the supernatant was applied to the Oasis HLB 96-well plate and the elute (10 L) was injected into the chromatographic system for analysis. The clinical applicability of the present method was evaluated by analyzing drug plasma concentrations in nine patients whose ages ranged between 33 and 68 years. All the subjects provided written informed consent before the start of the study. Patients received stable daily doses of sildenafil, tadalafil, bosentan, ambrisentan, or macitentan. Blood samples (7 mL) were collected after dosing. The study protocol was approved by the Ethics Committee of the Hamamatsu University School of Medicine and registered at the UMIN Clinical Trials Registry.

Results: All the peaks of 5 drugs were well separated, and the total run time was within 10 min. The calibration curves for the drugs in the plasma were linear in the following concentration

ranges: 1?"1000 ng/mL for sildenafil, 2?"2000 ng/mL for tadalafil, 5?"1000 ng/mL for ambrisentan, and 10?"10000 ng/mL for bosentan and macitentan. The correlation coefficient for each curve was higher than 0.986. The accuracy and precision values ranged from 85.2% to 111% and from 0.8% to 7.9%, respectively. To prove the utility of this method, the plasma concentrations of five PAH drugs were determined after oral administration to nine patients with PAH. All concentrations were above the LLOQ for each drug and were comparable to previously reported values. Our method enables the plasma concentrations of these drugs to be determined 8 h after their administration.

Conclusion: We developed and validated a rapid LC-MS method to determine the concentrations of five PAH drugs in patients, using a simplified solid extraction protocol followed by a single LC-MS run. This approach is useful and applicable for TDM in laboratory and clinical settings to assess PAH treatment in patients.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 30-M

Poster Title: Total and excess costs associated with bipolar I disorder in the United States in 2015

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Purpose: Bipolar disorder (BD) is a mood disorder characterized by depressive and manic/hypomanic episodes. BD type I (BDI) is estimated to affect approximately 1% of the United States (US) population. BDI-related mania or mania with mixed features can be associated with significant long-lasting health, social, and financial burdens. However, there is scant information on contemporary estimates of the costs of BDI, which may have been impacted by the disease management and structural changes over the last years. This study aims to estimate the total and excess costs of BDI in 2015 from a US societal perspective.

Methods: A prevalence-based approach was used to assess direct healthcare, direct non-healthcare, and indirect costs associated with adults with BDI in 2015 in the US. Direct healthcare costs (pharmacy and medical) were estimated based on a retrospective matched cohort design where adults with and without BDI with similar demographics were matched using the Truven Health Analytics MarketScan Commercial Claims and Encounters, Medicare Supplemental, and Medicaid Multistate databases, which complied with the patient requirements of the Health Insurance Portability and Accountability Act. Direct non-healthcare costs included substance abuse-related expenditures (justice system, crime victims, productivity loss from incarceration, prevention/research, vehicle accident) and research and training related to BD. Indirect costs included caregiving costs (productivity loss due to caregiving and excess healthcare costs incurred by caregivers), productivity loss from unemployment, productivity loss from premature mortality (e.g., suicide, comorbidities), and reduced productivity at work (among employed individuals). Direct non-healthcare and indirect costs were estimated based on data from the literature and governmental publications. Total

costs were estimated based on all costs incurred by individuals with BDI while excess costs were based on the cost differences between individuals with BDI and the general US population. Costs were adjusted for inflation and expressed in 2015 US dollars. Sensitivity analyses were conducted to assess the robustness of the estimates and account for differences in published estimates.

Results: In 2015, the total cost of BDI in the US was estimated at $202.1 billion (ranging from $182.5 to $207.3 billion based on the most and least conservative estimates); the largest contributors were productivity loss from unemployment (36%), caregiving costs (25%), and direct healthcare costs (23%). The excess cost of BDI was estimated at $119.8 billion (ranging from $101.2 to $124.3 billion); the largest contributors were caregiving costs (36%), direct healthcare costs (21%), and productivity loss from unemployment (20%). Direct healthcare costs were estimated based on 202,019 and 604,705 individuals with and without BDI. Total and excess direct healthcare costs of BDI were estimated at $18,931 and $10,162 per individual/year for a total of $46.9 and $25.2 billion. Direct non-healthcare total and excess costs were estimated at $9.0 and $6.8 billion (excess costs: $6.7 billion for substance abuse; $0.1 billion in research and training). Indirect total and excess costs were estimated at $146.2 and $87.8 billion (excess costs: $42.8 billion from productivity loss due to caregiving; $24.2 billion from productivity loss from unemployment; $10.6 billion from productivity loss from premature mortality; $9.3 billion from reduced work productivity; 0.9 billion from excess healthcare costs incurred by caregivers).

Conclusion: BDI is associated with significant total and excess costs from a US societal perspective; on average, the annual total and excess costs per individual with BDI were estimated at $81,559 and $48,333 in 2015. The importance of the excess direct healthcare costs and the magnitude of the excess costs due to caregiving and productivity loss from unemployment suggest that effective treatments and interventions to ameliorate disease management and symptoms should be targeted. This study is an important update to the existing literature on the economic burden of BDI and enhances the state of knowledge on this condition.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 31-M

Poster Title: Real-world evidence on the use of three recently approved long acting injectable antipsychotics in the United States: statistical and cost analysis in patients with schizophrenia

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Purpose: Long acting injectable (LAI) antipsychotics are an important therapeutic option for patients with schizophrenia. Using real-world evidence **(**RWE), we aimed to compare demographic characteristics, treatment patterns and associated costs in patients with schizophrenia receiving three recently approved LAIs in the United States (US): aripiprazole (AP), aripiprazole lauroxil (APL) and paliperidone palmitate (PP) (3-month injection).

Methods: This retrospective analysis, based on DRG's RWE repository, included patients with schizophrenia with at least one pharmacy claim for the following LAIs between March 2013 and June 2016: AP (300mg/400mg once monthly), APL (441mg/663mg once monthly; 882mg once every 4-6 weeks) and PP (273mg/410mg/546mg/819mg once every 3 months). Patients' age and gender, time from diagnosis to receiving first treatment with one of the three LAIs and frequency of injection were assessed. Using insurance claims data, a cost analysis was conducted on patients for whom therapy costs were available. The mean total daily costs of each therapy (medical, pharmacy and hospital costs) before treatment initiation (BTI) and after treatment initiation (ATI) were compared between treatments over the study period. Cost analyses were performed in patients who during the study period had not received both treatments considered in the comparison; therefore, the total monthly costs of AP may vary between analyses.

Results: Data from 4,077 patients with schizophrenia were analyzed (AP=3,080; PP=714; APL=283). The mean age (years) of patients receiving AP (40.1 13.5**)** for the first time within the study period was significantly lower vs. patients receiving APL and PP. The median time between injections (days, IQR) was: 28.0 (21.6 40.0) for patients with AP 300mg/400mg [n=2,532]; 28.8 (25.0 77.1), 27.9 (21.1-44.1), and 28.4 (22.0-37.4) for APL 441mg, 662mg, and

882mg [n=124]; 46.0 (28.0 99.9) for PP 273mg, 410mg, 546mg, and 819mg [n=191]. With all LAIs significant reductions were seen in monthly medical costs/patient ATI (mean difference standard error [SE]) vs. costs BTI: AP, $198.8 42.7, $p < 0.001$; APL, $134.7 64.8, $p < 0.05$; PP, $126.9 33.7, $p < 0.001$. Due to increased daily pharmacy costs vs. costs BTI, the total monthly therapy costs/patient (mean difference SE) were statistically significantly higher after treatment with PP ($892.3 64.8, $p < 0.001$) and APL ($575.7 88.5, $p < 0.001$) but not with AP ($65.1 68.8, $p=0.344$). Patients treated with AP had significantly lower total monthly therapy costs vs. those treated with APL ($812.9 23.5 vs $1,333.0 92.7; $p < 0.001$) and PP ($833.2 24.0 vs $2,064.2 46.9, $p < 0.001$).

Conclusion: Patients receiving AP were significantly younger than those receiving APL and PP. The frequency of injection was in line with prescribed dosing for AP (both doses) and APL 441mg and 662mg. For APL 882mg, most patients received treatment at the shorter prescribed dosing interval (4 weeks). PP (all doses) was received by most patients at a shorter dosing interval than prescribed. Treatment with AP led to a statistically significantly lower cost impact vs. PP and APL.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 32-M

Poster Title: Trends in identification of medication-related problems and resolution by Medicare insurance type

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Purpose: To evaluate the occurrence of medication-related problems (MRPs) by type (adherence, guidelines, cost, and safety) and the acceptance rates of interventions by type, between Medicare Advantage Prescription Drug plans (MAPDs) and Prescription Drug Plans (PDPs) and to identify trends in the data between the two contract years (2014 and 2015).

Methods: This retrospective evaluation utilized 2014 and 2015 outcome summary reports generated by a national Medication Therapy Management (MTM) provider for all individual contracted plans. Data collected for each contract included: plan type; total number of eligible patients; total number of MRPs identified; number of therapy interventions; and number of problems resolved. Interventions were categorized by type: safety, cost, guideline gap, or adherence gap. The primary outcome, prevalence of MRPs identified, was computed from the total number of MRPs identified divided by the total number of qualified patients. The secondary outcome, acceptance and resolution rate of interventions, was computed from the number of interventions accepted divided by the number of MRPs identified with measurable data. Prevalence and intervention resolution rate data, according to therapy intervention type, were compared between MAPDs and PDPs. A Chi Squared Test was used for this analysis. Qualitative analysis also was conducted to compare the 2014 and 2015 data to identify trends between the two contract years. Statistically significant differences in frequency were assessed at an alpha level less than 0.05.

Results: The 2014 data included 167,094 members from 68 MAPD plans and 638,813 members from 28 PDP plans with 162,176 MRPs total. The 2015 dataset contained 152,235 from 77 MAPD plans and 571,013 members from 275 PDP plans with 596,308 MRPs. In 2014 and 2015,

MAPDs had more adherence problems than PDPs (p less than 0.0001p less than 0.0001); however, MAPDs accepted less adherence recommendations (p less than 0.0001; p less than 0.0001). MAPDs also had more guideline gaps in both years (p less than 0.0001; p less than 0.0001); yet MADPs accepted less guideline gap interventions in 2014 (p less than 0.0001) but accepted more in 2015 (p less than 0.0001). In both years, MAPDs had less medication-related safety problems than PDPs (p less than 0.0001; p less than 0.0001) and accepted more safety interventions (p less than 0.0001; p less than 0.0001). During 2014, MAPDs used more high-cost medications (p less than 0.0001) and accepted more cost-saving interventions (p less than 0.0001). In 2015, MAPDs used less high-cost medications (p less than 0.0001) and accepted less cost-saving interventions (p equals 0.3533).

Conclusion: This retrospective evaluation showed some statistically significant differences in the number of medication-related problems identified and resolved between MAPDs and PDPs. These initial findings are encouraging, yet further evaluation is needed to identify whether other factors (e.g., member characteristics, environmental factors) influenced the observed differences between health plans. Finally, additional research is warranted to determine the generalizability of these results and whether these trends hold across longer-term investigations.

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 33-M

Poster Title: Implementing a smart pump alert reduction program in a multi-hospital, academic, tertiary medical center

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Purpose: The purpose of the process improvement was to decrease the incidence of unnecessary smart pump alerts through the feedback of a multidisciplinary group. The aim was to decrease alert volume to lessen alert fatigue experienced by staff administering intravenous infusion medications and fluids and to increase their attention to the most critical alerts.

Methods: Vanderbilt University Medical Center (VUMC) smart pump editors attended a two day data conference, and skills for pulling and mining data for pump alerting were developed. A multidisciplinary group was formed as a subgroup to the medication safety committee to focus on smart pump oversight. An aim was defined to decrease alert frequency to less than 4% in 6 months. The group was divided into an adult and pediatric subgroup to focus on the diverse content in the adult versus pediatric smart pump profiles. Alert data was collated for the smart pump subgroups every other month. Alert data was queried via a web-based data portal into an EXCEL document and collated by pivot tables into the top 10 alerting medications in both the adult and pediatric profiles. Data was organized by pharmacy informatics residents for presentation. The top 10 alerts were evaluated for appropriateness by the subgroup. If they were deemed to be within usual practice limits or unnecessary alerts, potential edits to the smart pump settings for that medication were discussed. Consensus was gained by subgroup members to library edits for the next library version. Additional key stakeholders were contacted to vet library changes as needed. Smart pump library requests with the agreed upon changes were entered and pushed with the next wireless smart pump library update.

Results: When initial discussion of decreasing infusion pump alerts occurred, baseline alerting percentage was > 9%. A first effort to lower alerts involved removal of soft minimum alerts in adult IV fluids. This decreased alert percentage to < 7% in summer 2016. The first smart pump subgroup meeting occurred in December 2016 with a few alert reduction edits in the January 2017 library version. The smart pump subgroups have continued to meet every other month with significant impact to alerting percentage secondary to library edits completed. Current VUMC infusion with alerts percentage is 4.74%.

Conclusion: Significant improvement of unnecessary smart pump alert volumes and percentages can occur within a multidisciplinary effort. Wireless pump data can be collated and assessed to evaluate whether alerts are meaningful. Smart pump medication limit settings can be adjusted to limit less valuable alerts to make more critical alert more impactful to those administering medications.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 34-M

Poster Title: Assessing conformance of healthcare system policies and procedures with ASHP best practice guidelines on preventing diversion of controlled substances

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Purpose: Drug diversion by healthcare staff is a significant problem that compromises safe medication practices, may adversely affect employees, and is an affront to patient safety. Every healthcare system should have systematic, coordinated, and continuous operations to ensure drug diversion can be readily identified, promptly addressed, and minimized to the fullest extent possible. In accordance with this regard, an evaluation mechanism was developed to measure the compliance rate of existing health system policies and procedures for controlled substances with ASHP Best Practice Guidelines on preventing diversion of controlled substances.

Methods: ASHP Guidelines on Preventing Diversion of Controlled Substances that were published in October 2016 served as the basis for development of an assessment tool. A template was created to address each category within the ASHP guidelines. There were fourteen categories, each containing a variable number of items. Each category was referenced with a section number where detailed information about each item could be found on the template. A comment section was included for each item so that specific information about the nature of a 'yes' or 'no' response could be clarified or explained, if needed. There was a total of 252 possible yes/no responses among items within the fourteen categories. A compliance rate was calculated for each category via a ratio of 'yes' responses to total number of items. An over-all compliance rate was calculated to determine how well healthcare system controlled substances practices, policies, and procedures compare with ASHP Best Practice Guidelines.

Results: Tabulation of 'yes' responses on the assessment template served as the basis for calculating a compliance rate. The greater the compliance rate with ASHP Best Practices Guidelines, the greater the likelihood that controlled substance diversion may be minimized. Note that while the assessment template is based on best practice guidelines rather than

codified regulations, evidence indicates that adherence is commensurate with an effective drug diversion detection, prevention and response program. Compliance with the ASHP Best Practice standards serve as validation that healthcare system policies and procedures are proactive, and that the organization is taking responsible action to prevent, detect and respond to drug diversion. An organizational goal of all healthcare systems should be to ensure that a high compliance rate with the ASHP guidelines remain consistent and verified with periodic assessments. In this way, the likelihood of protecting patients, employees and the community from drug diversion issues might best be realized.

Conclusion: Healthcare systems need a mechanism to ensure controlled substance policies and procedures for the prevention, detection and response to potential diversion are not only adequate, but also proactive. By utilizing the assessment tool compiled from ASHP guidelines, gaps can be identified in existing policies and procedures for corrective action and modification. A compliance rate of 90% or better is an indication that healthcare systems are meeting the challenge towards preventing and reducing drug diversion activity. Additionally, for benchmarking purposes, calculated compliance rates from other healthcare systems can provide valuable aggregate data which can be incorporated into continuous quality improvement initiatives

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 35-M

Poster Title: Naloxone trigger project: Evaluating and improving safety of inpatient opioid use

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Purpose: The Joint Commission released a Sentinel Event Alert in 2012 regarding the safe use of opioids in hospitals, as these agents rank among the drugs most frequently associated with adverse drug events (ADEs). Important points included screening patients for risk of respiratory depression, assessing prior opioid tolerance to appropriately choose a safe regimen, and the need for hospitals to track and evaluate opioid ADEs. As part of a health-system initiative to improve opioid safety, a naloxone trigger review was utilized to analyze opioid ADEs at a tertiary-care institution with the results determining interventions designed to reduce opioid ADEs.

Methods: This quality initiative was reviewed by the system investigational review board and deemed non-research and appropriate for a descriptive report. A multidisciplinary health-system opioid safety team led an initiative to add risk stratification for sedation and respiratory depression to existing order sets for intermittent opioids. A literature review was conducted regarding utilizing naloxone trigger methodology to evaluate opioid safety, and a report was created to detect the use of naloxone. A form was developed to assist in event analysis featuring patient comorbidities that increase risk of opioid ADEs, prior opioid use history, and a preventability matrix. The team provided inter-rater reliability, analyzing each case via reviewing opioid/sedating medication use in the 24 hours prior to naloxone administration, assessing event preventability, and identifying opportunities for improvement. The project outcomes were monitored via the pharmacy services scorecard with a denominator added (preventable events per 1000-charged opioid doses) to assist in inter-hospital comparison. As results became available, presentations to nursing and physician committees occurred highlighting trends and strategies for ADE reductions. Specific trend analysis reports were provided to units or services with a higher incidence of naloxone use for evaluation and error-mitigation strategies. Nursing education was developed regarding the danger of concurrent sedating medications with opioids and strategies to stagger administration times. Procedural

areas adopted the Richmond Agitation-Sedation Scale (RASS) for improved assessment of sedation and respiratory depression.

Results: The project commenced in fiscal year (FY) 2014 and preventable events were categorized by patient age, pertinent risk factors, opioid history, nursing unit, service line of prescriber and causative opioid. There were 81 events deemed preventable at the tertiary-care institution in FY2014, and these results were a baseline for assessment and intervention strategies. Event incidence was higher in females than males, and 90% of events occurred in patients with at least one comorbidity that placed them at higher risk for respiratory depression (age greater than 60, obesity, renal impairment, obstructive sleep apnea or chronic obstructive pulmonary disease). Injectable hydromorphone was implicated in 60% of event cases. Educational outreach and data sharing occurred with multiple nursing and physician groups as well as service lines for the development of intervention strategies, leading to improved results in FY2015. There were 48 events deemed preventable representing a 40% decrease from the previous year. Trend analysis revealed similar results in terms of patient characteristics and causative opioid. Ongoing outreach and education occurred with outcomes continuing to improve in FY2016, when 27 events were deemed preventable by the opioid safety team, a 43% decrease from FY2015 and a 66% decrease from FY2014.

Conclusion: A multidisciplinary health-system opioid safety team designed a naloxone trigger project to evaluate and improve the safety of inpatient opioid use. Naloxone events were analyzed for preventability and patient risk factors for opioid ADEs. System-wide risk-stratified opioid order sets were developed and implemented. At a member hospital, outreach and education to nursing and physician committees occurred highlighting project results and ADE-reduction strategies. This multidisciplinary, multi-pronged approach led to a 66% reduction of preventable opioid ADEs over a three-year period.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 36-M

Poster Title: Adverse Drug Reactions (ADRs) in Palliative Care: A Retrospective Review

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Purpose: The purpose of this study was to assess the incidence of adverse drug reactions in a palliative care population, and to assess their severity and preventability. Secondarily, we sought to evaluate associations between severity, preventability and patient-specific factors. Thirdly, we sought to examine the specific drugs or drug classes most commonly involved in adverse drug reactions occurring within a palliative care population.

Methods: All adult patients receiving a consult from the institution's palliative care service between 9/15/15 and 3/15/16 were eligible for inclusion. Records were excluded if the electronic medical record did not contain adequate documentation of medical note for admission history & physical. Electronic medical records were manually reviewed and detailed information was captured regarding patient demographics and data relevant to analysis of documented adverse drug events. Data collected included gender, age, height, weight, background history and problem list, drug allergies, number of inpatient visits during the study period, admission reason and chief complaint, prescribed medications, and laboratory values. Additionally, all progress notes concerning adverse drug reactions were reviewed for information detailing the incident, contributing factors and/or outcomes. Staging of severity for ADRs was determined using the Modified Hartwig and Siegel scale. Staging of preventability was determined using the Modified Schumock and Thornton Scale. The patient's comorbidity score was determined using the Charlson Comorbidity index. The data was analyzed using the SPSS version 23. Chi square tests were used for analyzing dichotomous data. Preventability scores were analyzed as dichotomous variables. Linear regression was used to analyze associations between patient characteristics and study outcome variables.

Results: During the study period, 430 patients had received a consult from the palliative care service. This sample was 56.7% female, an average age of 79 years (13.4), and Charlson Comorbidity Index score of 6.5 (2.5). Of these, 57.7% (248/430) experienced an ADR. Forty-seven percent of patients had more than one inpatient admission at our hospital during the study period. There was a total of 446 ADRs documented for patients in the sample, with the majority of patients experiencing one (52.4%) or two (26.6%) ADRs. Patients who had a documented history of drug allergy were more likely to have experienced an ADR ($p < 0.0001$), as were those patients with increased number of inpatient admissions during the study period ($p < 0.0001$). Sixty-six percent of ADRs experienced were deemed potentially preventable. There was a weak, yet significant association between severity and preventability. Those deemed preventable were associated with an average severity score of 3.12 while those with ADRs deemed not preventable were associated with severity scores of 3.43 ($p=0.02$).The organ system most commonly affected was CNS (15.0%), followed by bladder/bowel/GI (13.9%). The medications most common associated with ADRs were antimicrobials, opioids, and anticoagulants.

Conclusion: Certain patient-specific factors may be associated with the occurrence of an adverse drug reaction in palliative care patients. Specifically, those with documented drug allergies and increased number of hospitalizations may be more likely to experience and adverse drug reaction. While many ADRs may be considered preventable, those that are not preventable tend to be associated with greater severity. Pharmacists can play an important role in identifying patients at greater risk of ADRs and closely monitoring drug therapy.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 1-T

Poster Title: Supporting the prior authorization process for patients through specialty pharmacy services

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Purpose: Access to specialty medications is a challenge for patients due to the high-cost and formulary restrictions of insurers. Specialty clinics commonly manage patients with conditions that require specialty medications and would benefit from improved access to these therapies.

Methods: The University of Vermont Medical Center Specialty Pharmacy has partnered clinical pharmacists into ambulatory specialty clinics, including Dermatology, Gastroenterology, Neurology, Oncology, Rheumatology, and Transplant. The pharmacists have been assisting prescribers and patients with the prior authorization process, when requests for specialty medications have been initially denied by patients' insurance plans.

Results: The process for appealing denied medications has been fully implemented by the University of Vermont Medical Center Specialty Pharmacy. Upon notice of prescription denial, the clinical responsible for the associated specialty clinic is alerted via the electronic health record. The pharmacists evaluate each denial and, when appropriate, prepare an appeal letter for review and submission to insurance companies. If pharmacists deem the denial to be appropriate, they work directly with the prescribers and patients on alternative treatment plans. To date, appeal letters have overturned 82% of initial denials.

Conclusion: Pharmacists are uniquely qualified to support patients obtaining access to optimal treatments. This process includes managing the prior authorization process for accessing specialty medications. The involvement of pharmacists results in a high proportion of initial denials to be overturned, which allows patients to obtain optimal specialty treatments.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 2-T

Poster Title: Evaluate, develop, and implement medication safety measures using medication error reporting systems and medical records

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Purpose: Medication related errors claim as many as 98,000 Americans each year and are the eighth leading cause of death in the United States. One-half of all hospital-related medication errors and 20 percent of all adverse drug events (ADEs) were attributed to poor communication. From that data, this leaves about 1.5 million preventable ADEs annually as a result of medication errors. To address this issue, hospitals and clinics have tried to update policies and procedures to decrease medication related errors. The purpose of this project was to identify medication safety areas for improvement in outpatient clinics in a collaborative practice setting.

Methods: This was an institutional review board approved retrospective study to evaluate, develop, and implement medication safety measures. Data was collected on patients greater than 18 years old who visited UF Health Jacksonville outpatient clinics between July 1, 2011 and May 29, 2014. Patients under the age of 18 years old, incarcerated or had incomplete medical records were excluded. Data collected using the electronic medical records and error tracking tools at UF Health Jacksonville was compared to information published by the Doctors Company, a large physician owned malpractice group. The Doctors Company reported that medication related errors accounted for 12 percent (n equals 363) of their claims from January 2004 to January 2006. The comparison reviewed data that was classified into monitoring errors, dosage errors, inappropriate medication errors, medication side effect errors, medication reconciliation errors, and medication allergic reaction errors. The primary outcome was the difference in error types and rates between retrospective data compiled from the UF Health Jacksonville outpatient clinics compared to the previously published Doctors Company data. The comparison was used to identify areas of improvement and implement changes to

decrease medication errors in the outpatient clinics. Fisher's Exact tests and descriptive statistics were used to evaluate and compare data.

Results: For the primary outcome, there was a significant difference identified in the type of errors at UF Health Jacksonville outpatient clinics compared to the Doctors Company. Medication side effect errors accounted for the majority of errors, 87 percent (n equals 347), at UF Health Jacksonville. In contrast, the majority of errors in the Doctors Company were monitoring errors and accounted for 44 percent (n equals 43) of their claims. There was also a difference in type of error identified between specialty and primary care clinics at UF Health Jacksonville. Medication side effects errors accounted for 93 percent (n equals 292) in specialty clinics versus 55 percent (n equals 55) in primary care clinics. During data collection, the majority of the data came from analyzing the number of diagnostic codes for adverse drug events versus the number reported via the hospital electronic reporting tool. From this discrepancy, we found that a streamlined method for reporting errors was needed due to inadequate reporting in the hospital reporting tool. A more efficient method was implemented with direct provider education which resulted in a 67 percent (n equals 3) increase in documentation with reporting medication errors over a one-month period.

Conclusion: There was a significant difference in the medication errors reported by the Doctors Company when compared to UF Health Jacksonville outpatient clinics. Adequate reporting of medication errors is important to identify areas for improvement and to implement medication safety measures. Our study showed that targeted interventions, such as direct provider education, along with ease of documentation increased reporting over a one-month period. Further research is needed to identify the long-term implications of these interventions and impact on medication safety.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 3-T

Poster Title: Impact of Pharmacy Services on Healthcare Effectiveness Data and Information Set and Pay for Performance core measures in a non-academic primary care setting

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Purpose: Healthcare Effectiveness Data and Information Set (HEDIS) and Pay for Performance (P4P) are quality initiatives used by more than 90 percent of health plans in the United States. The results of these measures allow health plans to strategize efforts to improve quality patient care. The purpose of this project is to assess how a pharmacy-led team is used to identify quality metric gaps, and close gaps to reach the 75th percentile in order to improve health outcomes in a managed care population.

Methods: Quality metric reports were obtained and analyzed to identify gaps in a managed care population. The pharmacy team (pharmacy residents and students) focused on cardiovascular and diabetes measures; specifically controlling blood pressure for people with hypertension, and two-hemoglobin A1C (HbA1c) tests within a calendar year, annual nephropathy monitoring, and blood pressure control for people with diabetes. Medical assistants (MAs) and the pharmacy team made outbound calls to recruit patients with these identified gaps. The pharmacy team met with patients to identify barriers to care, order appropriate labs, optimize therapy, and provide education. This was achieved by approval of a collaborative practice agreement. Follow up appointments were scheduled with the pharmacy team until the patient met their diagnosis goal. Throughout this process, the pharmacy team was used as an extension of the patient's primary care provider. All gaps closed were achieved in eight weeks.

Results: According to health plan data, 218 hypertension gaps were identified. In order to achieve our goal of meeting the 75th percentile, 73 patients needed their last blood pressure reading to be within the last calendar year and less than 140/90 mmHg. Thirty-one of the 73 gaps needed to achieve goal were successfully closed. For patients with a diagnosis of diabetes, 243 patients were missing two A1C lab(s) in a calendar year. Of those patients, 109 patients

were required to complete A1C lab(s). Fifty-one of the 109 gaps needed to achieve goal were successfully closed. For patients with a diagnosis of diabetes and hypertension, 72 patients needed their last blood pressure reading to be within the last calendar year and less than 140/90 mmHg. Forty patients were needed to reach their hypertension goal. Twenty-nine of the 40 gaps needed to achieve goal were successfully closed. For the senior population, 48 nephropathy gaps were identified. Fifteen patients needed to complete a random microalbumin. The number increased to 28 the following month which indicates 13 newly identified patients past due for a random microalbumin. Eighteen of the 28 gaps needed to needed to complete a random microalbumin were successfully closed.

Conclusion: Pharmacy led efforts were helpful in identifying and correcting quality metric gaps in a managed care population. Implementing a collaborative practice agreement not only increases physician and clinical pharmacist relations but also creates the opportunity for pharmacists to identify quality metric gaps, assess patients in clinic, and increase quality metrics.

Submission Category: Ambulatory Care

Session-Board Number: 4-T

Poster Title: Enrollment in a pharmacist-managed hepatitis C virus clinic care delivery model and associated outcomes

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Purpose: Despite recent advancements in the treatment of hepatitis C virus (HCV), the optimal health care delivery model for providing HCV services remains unknown. Although pharmacists' involvement in therapy management has been shown to improve the quality of patient care for other disease states, little is known about the effect of pharmacists' involvement in modern HCV management on outcomes such as therapy completion and successfully curing HCV. The purpose of this study is to evaluate an existing pharmacist-managed HCV clinic model versus an HCV clinic with some pharmacist involvement, and to describe the predictors of enrollment in the pharmacist-managed HCV clinic.

Methods: This was a retrospective cohort study of patients aged ?-18 years old receiving HCV treatment between January 2015 and December 2016 at one of two clinic sites within a single health system: (1) a pharmacist-managed HCV clinic and (2) a clinic providing usual care with some pharmacist involvement. Potential predictors of enrollment in the pharmacist-managed clinic versus the clinic with some pharmacist involvement included clinical characteristics (i.e., risk factors for contracting HCV and markers of severe hepatic disease), demographic information, household income, and health insurance status. We used univariable and multivariable logistic regression to estimate the association between the predictors and enrollment in the pharmacist-managed outpatient HCV clinic versus enrollment in the clinic with some pharmacist involvement. Lastly, we used inverse probability of treatment-weighted logistic regression to compare treatment completion and HCV cure (sustained virologic response 12 [SVR 12] weeks following treatment completion) between the two HCV clinic models. Statistical significance was considered at the alpha=0.1 significance level.

Results: A total of 127 patients initiated HCV treatment therapy: 64 patients from the pharmacist-managed clinic and 63 patients from the clinic with some pharmacist involvement. The mean age was 55 years. Overall, 51% of patients were male and 68% of patients identified as white. There were a total of 5 failures to complete treatment and 9 failures to achieve SVR 12. In multivariable analyses, predictors of enrollment at the pharmacist-managed clinic versus the clinic with some pharmacist involvement included male sex (OR 15.4, 95%CI 4.4-54.4, p= < 0.001), black race (OR 6.8, 95% CI 1.5-31.5, p=0.01), history of incarceration (OR 6.1, 95% CI 1.4-26.7, p=0.01), presence of cirrhosis (OR 2.8, 95% CI 0.8-9.6, p=0.09), and history of intranasal drug use (OR 3.1, 95% CI 0.9-10.1, p=0.07). In inverse probability weighted analyses, there was no difference in treatment completion (OR 1.1, 95% CI 0.1-13.8, p=0.93) or achieving SVR 12 (OR 0.9, 95% CI 0.2-4.0, p=0.87) between the pharmacist managed clinic and the clinic with some pharmacist involvement.

Conclusion: Strong predictors of enrollment in a pharmacist managed HCV clinic compared to a HCV clinic with some pharmacist involvement included male sex, cirrhosis, and history of incarceration. Overall, there was no significant difference in rates of HCV treatment completion rates and achievement of SVR 12 between patients enrolled at the pharmacist-managed HCV clinic and the clinic with some pharmacist involvement. Our findings suggest that both care delivery models involving pharmacists were able to provide effective high-quality care for patients with HCV. Health care systems may consider incorporating pharmacists using either health care delivery model for the management of HCV.

2017 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 5-T

Poster Title: Factors critical in forming collaborative physician-pharmacist relationships in the delivery of comprehensive medication management (CMM)

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Purpose: To identify and describe strategies that have successfully achieved collaboration among physicians and pharmacists providing comprehensive medication management(CMM) to support development of CMM services.

Methods: We employed a two-phase, mixed-methods approach combining quantitative and qualitative methods to identify strategies that have been successful in building pharmacist-physician relationships in primary care clinic settings. Phase 1 used a qualitative approach to identify strategies deemed successful in building relationships with physicians. An advisory group of pharmacists with experience building CMM practices was convened to assist with development of a list of minimum criteria that would characterize CMM-providing pharmacists as having strong collaborative relationships. This criteria was used to identify key informants who were the first pharmacist in pharmacist-naive clinics, had responsibility for establishing CMM services, and had developed effective pharmacist-physician relationships. Semi-structured interviews were conducted with ten key informants meeting criteria. Questions centered on the key elements and strategies that lead to development of successful collaborative relationships. Two researchers coded interview transcripts and identified the resulting strategies. Codes and their definitions were shared with participants to ensure validity of the results through member checking. Phase 2 employed quantitative methods to enhance interpretation of the identified strategies. A survey instrument was developed to determine how frequently identified strategies are utilized and evaluate the relative level of perceived impact of each strategy. This survey was distributed to a national audience of pharmacists practicing in ambulatory care settings utilizing pharmacy organization email message services. Responses from pharmacists meeting a pre-specified criteria were included in the analysis.

Results: Thirty-three strategies were identified and grouped into nine themes that include the following: creating a presence in clinic, making personal connections, tailoring relationship building efforts to individual physicians, laying a relationship foundation, being a strong clinician, purposefully sharing patient care, showing respect and managing conflict, and integrating into clinic. In Phase 2, 104 survey respondents met defined criteria and were eligible to endorse use of identified strategies and rate their relative influence. The five most frequent strategies utilized by at least 90% of respondents included: 1) being consistently available for medication-related questions and tasks, 2) proactively engaging in pharmacotherapy discussions or activities, 3) conveying a sense of confidence in clinical skills and training 4) being reliable as a clinician and 5) verbalizing clinical thought process. Strategies most commonly rated to be "extremely" or "very" influential on pharmacist-physician relationships included: 1) ensuring close proximity of work spaces, 2) actively moving in clinic to increase visibility, 3) being consistently available for medication-related questions and tasks, 4) focusing on early adopting physicians, 5) being reliable as a clinician, and 6) being collegial and showing professional respect.

Conclusion: Effective strategies to develop pharmacist-physician relationships in the delivery of CMM were identified and ranked by experienced practitioners in terms of perceived influence. Strategies presented in this format can provide more precise guidance to those practitioners and learners initiating CMM services, accelerating the time required to establish strong collaborative relationships with physician colleagues.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 6-T

Poster Title: Assessing needs for development of an enterprise pharmacy informatics dashboard using a data warehouse

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Purpose: The use of clinical data warehouses (CDW) to improve patient quality and safety have been increasing in recent years. A CDW allows clinicians and analysts to determine trends and alert practitioners in real time through dashboards. Pharmacy informatics teams should be involved in development and implementation of clinical dashboards. At the Hospital Corporation of America (HCA), an analysis group was developed to define data fields to be incorporated in the CDW to assist in determining the effectiveness of clinical decision support (CDS) tools developed within the CPOE system.

Methods: HCA consists of 171 hospitals across the United States and England. The medication management group has developed and deployed a variety of medication-related CDS tools throughout the company to improve patient safety and workflow efficiency. It was determined that an informatics dashboard could be created to illustrate the effectiveness of the CDS developed. The medication management group also wanted to review trends in drug use to be used later to extrapolate into drugs costs and overall drug spend. The informatics resident reviewed projects from the Medication Management Advancement Project (MMAP) and other key informatics projects to determine data points to be incorporated into the clinical data warehouse. The list was shared with other informatics pharmacist in order to get a complete inventory of key information to be included. These include medication use information, the corresponding CDS queries and responses, and how many times the specific queries were prompted to the clinician. The data points were reviewed against the current CDW to determine what aspects needed to be included to provide the most useful information.

Results: Data points were grouped into three categories: dictionary data, rule data, and clinical data. Examples of dictionary data to be incorporated into the data warehouse included rule mnemonics built in each facility dictionary, if rules are active in dictionary, modules rules are enabled in, and which medication rules are attached. Rule data included number of times the rule fired, daily numbers for modules rule appears in, and answer to rule queries. Many clinical data points were already included in the CDW and more can be added depending on specifics of the CDS tool. Data points for current CDS tools include drug dose, drug route, drug frequency, lab test data, administration data, vital signs, and other clinical information.

Conclusion: CDWs are a valuable tool to evaluate clinical and workflow processes. However, clinician input is valuable in defining the data fields to be captured in the CDW. Pharmacy informaticist input in determining data to be captured in a CDW ensures the necessary foundation is established to develop an enterprise pharmacy informatics dashboard. Next steps include designing the informatics dashboard and determining the flow of data into the dashboard. Once the dashboard is created it can be used to show effectiveness of clinical decision support tools and cost savings.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 7-T

Poster Title: Implementation of smart infusion pump interoperability between the electronic medical record at a large academic medical center

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Purpose: The use and administration of intravenous medications is a potentially dangerous source of medication error. The use and implementation of smart pump integration with the electronic medical record (EMR) is designed to create a closed loop system for the administration of intravenous medications. By leveraging this technology, the smart pump will be pre-populated with the infusion parameters from the EMR through barcode scanning the patient, medication, and pump. Having the order details for these medications sent directly to the pump limits the amount of manual programming required by the end-user, which literature supports decreases medication errors and improves infusion management.

Methods: The kick-off for this project began in June 2016 with a multidisciplinary team including pharmacy, nursing, clinical engineering, clinical workflow support, project management, information technology, and representatives from our EMR and infusion pump vendors. To allow for the integration between the EMR and smart pump, identifiers were added to each medication to communicate across both platforms. The smart pump library required modifications to include individual entries for each possible method of dosing for a medication, including non-weight based, weight based, and body surface area based. These adjustments were necessary for all three patient profiles (Adults, Pediatrics, and NICU) within the smart pump library. In addition, per-day dosing strategies such as mg/kg/day and units/day for intermittent medications were discovered upon testing to unsuccessfully communicate with the pump. All these changes required consultation from various clinical pharmacy teams, including Pediatrics, Oncology, Investigational Drug, Services, Infectious Diseases, and Adult Medicine.

Results: Interoperability between the EMR and smart infusion pumps was fully implemented on March 2017. In preparation for this event, 902 medication records in the EMR were assigned identifiers to allow bidirectional communication with the smart infusion pump. To account for the different dosing methods of these medications, over 200 new library entries were created by the various clinical pharmacy teams. 196 medication records required removals of per-day dosing units in order to successfully communicate with the infusion pump. Over 1,300 medication orders were tested across four separate testing sessions which included nurses from various specialties and clinical pharmacists. Failures in EMR to smart pump communication were documented, fixed, and retested at a subsequent testing session. Preliminary data following the first week of implementation shows a compliance rate of EMR associations with the infusion pump at over 70% in the main hospital and over 90% in the long-term acute care hospital.

Conclusion: Following a 9-month timeline of project planning to go-live, infusion pump interoperability was successfully implemented leading to an anticipated improvement in medication safety and infusion management. Establishing this technology has allowed for readily available data on barcode compliance of intravenous drug administrations and manual pump programming actions including medication titrations and overridden drug alerts. Future considerations for hospitals planning on implementing smart pump and EMR integration includes assuring complete alignment of dosing methods between both platforms and creating a standard process to allow all incoming additions to the smart pump drug library to be tested for interoperability.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 8-T

Poster Title: Implementation for order of use of PRN pain medications in a large health system

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Purpose: The use of "pro re nata (PRN)" or "as needed" orders of opioid analgesics to manage acute pain is widespread in clinical practice. Providers often write for multiple pain medications in each pain scales to ensure that the patient's pain can be controlled without additional phone calls and delay in treatment. This practice allows nurses to pick one of the medications within the score to be given. The Joint Commission cites hospitals for this practice if there is no clear guidance provided to the nurse on when each pain medication within a pain scale should be utilized.

Methods: Based on The Joint Commission finding from several facilities, we assembled a sub-group from the Medication Management Advisory Board. The group was composed of facility and corporate physicians, nurses, pharmacist, informaticists and corporate regulatory personnel. The group developed guidelines to allow clinicians to better identify when to use multiple medications for the same prn reason. Along with pain medications, the group felt it was also important to add some other groups of medications that commonly have multiple medications ordered. These groups included nausea and vomiting, anxiety, constipation, and pruritus. Once all the categories of medications were identified, the group determined how it should be designed. The design allows for up to 3 medications to be ordered for each of the standardized pain scales and for each of the additional groups of medications identified. Nurses can move to the second or third pain medication within a pain scale if the current medication was ineffective or if a different route was needed without calling the provider to get a new order. By delimitating the order the medications are to be utilized, it allows nursing to practice within their scope and addresses the finding from The Joint Commission. A single entry was kept for occasions when a provider only ordered one medication for condition.

Results: The standardized pain scales are: Pain Scale 1-3; Pain Scale 4-6; and Pain Scale 7-10. The medications within the pain scales are ordered utilizing order of use. The mnemonic consists of the pain scale and order of use i.e 1-3 PAIN 1. The name consisted of Pain Scale 1-3 (Use 1st), Pain Scale 1-3 (Use 2nd) or 1-3 Pain Scale (Use 3rd). The drug mnemonic is seen by nursing on the electronic medication administration record (eMAR). We implemented the mnemonic with the numeric value first so that it was easy for the nurse to ascertain the pain scale the medication was associated with. Previously the nurse could not determine what pain scale was associated with the medication without opening the order which lead to nursing frustration since they had to open several orders to determine which medication to utilize. This method still requires the nurse to open the order to see if this was the 1st, 2nd or 3rd medication in the pain scale but they can easily see which orders go with which pain scale.

Conclusion: We published the prn pain reasons and tip sheet for the facilities to utilize. The adoption of the prn reasons need to be evaluated by each facility as it requires updating of order sets, label comments, providers favorites, quick scripts and P&T approval. There is oversight the facility pharmacists must perform. For example, a provider discontinues a 2nd choice medication without ordering another 2nd medication, the pharmacist will need ensure that a gap in the ordering of the treatment doesn't occur and either obtains a order for a 2nd choice or moves the 3rd choice to 2nd choice.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 9-T

Poster Title: Pharmacist intervention documentation (iVents) in an electronic medical record to improve medication safety

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Purpose: At an academic medical center, pharmacists review > 200,000 medication orders monthly utilizing an electronic medical record (EMR) EPIC®. Pharmacists document ~ 8,000 inventions per month utilizing an invention documentation (iVent) tool within the EMR. iVents are patient specific notes with discrete fields that can be reported for analysis. It has been challenging for the Department of Pharmaceutical Service to effectively analyze the impact of interventions to demonstrate outcomes metrics. The goal of this effort was to determine where pharmacists intervene, identify interventions that averted errors with harm potential, recognize trends with significant harm potential, and optimize iVent documentation system.

Methods: Over two years, the department made a series of efforts to optimize options, normalize definitions, and educate staff to standardize documentation approach and increase reporting. iVents have a variety of structured fields for data entry. The department modified 3 specific fields to provide structured responses: Type, Significance, and Documentation. Reports of iVents from the EMR were utilized to assess which "Types" of interventions fall into the possible harm prevention categories of No Harm, Temporary Harm, Permanent/Life Threatening Harm, and Procedural; and which intervention activities were being mis-categorized in Type. After completion of analysis, education on the definitions was provided to staff. The department worked in an iterative process of reviewing the iVents, gathering feedback from staff on utilization, and updating iVents. Following pharmacist education, the Medication Safety team began regular review of iVents with significant harm potential for systems fixes and quarterly analysis of iVents for trends and department report out to staff.

Results: From the September to December 2016 quarterly analysis, 24,161 iVents were submitted in total. Excluding iVents used for communication of operational activities, 17,342 iVents (72%) were actionable interventions on prescribing errors or clarifications. Dose change (5174), duplicate therapy (2962), and drug information (1993) were the most common types of interventions. There were 88 (0.5%) iVents categorized by clinical pharmacists as potentially averting permanent harm and 1162 (7%) categorized as preventing temporary harm. Manual review of iVents designated as preventing potential permanent harm by the medication safety team show that pharmacist self-categorization of severe potential may be overestimates of harm potential, however all interventions were meaningful. System fixes, such as updates to available dosing units in the EMR and changes to best practice alert wording, were implemented as a result of review of invention documentation and related patient charts.

Conclusion: Utilizing the structured fields within the intervention documentation has allowed the Department of Pharmaceutical Services to identify what proportion of iVents are actionable interventions by pharmacist vs communication documentation. The number of iVents flagged by staff as potentially preventing serious harm was 0.5%, which allowed for manual review by the medication safety team. System fixes could be identified by reviewing specific intervention documentation. The iterative process of optimizing the iVent system allows for continued improvements.

Submission Category: Automation/ Informatics

Session-Board Number: 10-T

Poster Title: Utilizing the electronic medical record to optimize REMS program medical center compliance

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Purpose: The FDA works with drug manufacturers to assure the safe use of medications. When appropriate, the FDA may require a new product or product with new safety risks to implement a Risk Evaluation and Mitigation Strategy (REMS). Prescriber, pharmacies and health systems have different elements necessary to comply with REMS programs, depending on the plan outlined by the FDA and drug company. Contents can include medication guides, communication plans, elements to assure safe use and implementation systems. Our medical center sought to utilize different features of our electronic medical record (EMR) EPIC® to optimize transparency and compliance to different REMS.

Methods: Our Department of Pharmaceutical Services reviewed all current REMS programs as listed on the FDA website and developed a list of formulary medications with REMS programs. Medications were prioritized for build into the EMR based on risk and other institutional considerations. Medications were discussed with pharmacist subject experts to identify key factors for each medication and current non electronic workflow for features of the REMS programs, such as ensuring prescribing eligibility. The department then met with the information technology team to identify and discuss systems features that could be utilized to increase end user REMS program knowledge and compliance.

Results: Two medications/classes identified by the department as top priority were clozapine and endothelin receptor antagonists (ambrisentan, bosentan and macitentan). Common features identified within the EMR were links from the order/verification entry screens to the REMS website and instructions within the order entry field with information on the program. Clozapine REMS requirements for inpatient use include provider and patient REMS enrollment and regular monitoring of absolute neutrophil count (ANC). EMR features identified as useful

for transparency of REMS elements included a required question in the order entry screen asking about provider enrollment to the REMS program, pharmacist templated note outlining REMS requirements with required fields, best practice alert for pharmacist on verification reminding of the templated note and messaging system to pharmacy management for patients ordered clozapine for oversight. These items were implemented in addition to non-EMR items, such as restricting ordering to only Psychiatry service and provider and pharmacist education. For the endothelin receptor antagonists, requirements vary slightly program but revolve around routine pregnancy testing in female patients of reproductive potential. The main EMR features identified as helpful were a series of required questions on order entry, which were built to branch to additional details when depending of previously answers.

Conclusion: Features within the EMR can be utilized to increase REMS program knowledge and compliance by end users. These are best done accessing each medication on formulary individually by a multi-specialty team, as REMS requirement and workflows vary. This must be done in conjunction with educational efforts to providers and pharmacists and other efforts such as formulary restrictions. Due to the regular changes to REMS, routine review of REMS program requirements should also be incorporated into maintenance workflows.

2017 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 11-T

Poster Title: KnockouT2: A mobile health application to help caregivers provide support to patients with type 2 diabetes mellitus.

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Purpose: According to the American Diabetes Association, diabetes remains the 7th leading cause of death in the United States in 2010 and in 2012, 9.3% of the population had type 2 diabetes mellitus (T2DM). Positive social support is critical for successful T2DM management. Too often, lack of education around glycemic control leads to complications that can be fatal. The purpose of this project was to develop a mobile health application to equip caregivers with knowledge and skills to properly manage others' T2DM in a fun, user-friendly game that will encourage them to continue to learn as the game progresses.

Methods: An interdisciplinary team was formed consisting of a pharmacist, public health specialist, computer scientist, game developer, and students. This team will bring substantive knowledge in diabetes management, health data analysis, and intelligent tutoring system design. For game development, KnockouT2 will use the entertainment education strategy for health education using an 80:20 entertainment-to-education ratio as a model. We also decided that KnockouT2 will be built as an intelligent tutoring system (ITS). While an ITS is traditionally used to create games or software that teach mathematics to students, it can be built to provide a learning feedback loop to learners about any educational domain. The KnockouT2 intelligent tutoring system will use data from initial game player interactions with the interface to estimate game player's knowledge and/or learning speed. For each player, based on the estimated knowledge of the player, one of several pre-programmed teaching strategy algorithms will be used to offer user-appropriate instruction via the KnockouT2 interface. The domain component of the program contains the diabetes-related content that all players should master. The Health Belief Model (HBM) will be the theory applied to game development to encourage players. The following four perceptions serve as the main constructs for the

model: perceived susceptibility, perceived severity, perceived benefits and barriers to engaging in a behavior, cues to action, and self-efficacy.

Results: After a literature review, we found that developing a mobile health application focusing on diabetes education could greatly decrease diabetes education disparities, especially in the self-pay or Medicaid population. KnockouT2 will primarily use "match-three puzzle" game design as its basis for keeping users motivated to play. Using the entertainment education strategy, approximately eighty percent of KnockouT2 gameplay will involve forming horizontal or vertical combinations of three or more identical elements. The other twenty percent of gameplay will involve learning and applying diabetes knowledge and skills. Players will use a finger swipe motion on any touchscreen to move food elements around the Main Puzzle Area. The Main Puzzle Area of the KnockouT2 interface will be presented to players multiple times while progressing through 10 levels inside 10 separate "worlds" of diabetes. Each of the 10 levels represents increasingly difficult levels of the world, with level 1 being the least difficult and level 10 being hardest. The number of times that each player sees the Main Puzzle Area will depend on how well they play the game--perfect players will see the Main Puzzle Area exactly 10 times. Between each of the 10 levels, interactive diabetes-related educational knowledge and skills will be inserted.

Conclusion: Diabetes education disparities are alarmingly high, and a widely available educational tool is urgently needed. To our knowledge, KnockouT2 is the first diabetes management educational game targeting adult caregivers. Future areas of study include the increase in knowledge of the caregiver post-gameplay, caregiver satisfaction, and effect of caregiver gameplay and increase in knowledge on patients' glycemic control.

2017 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 12-T

Poster Title: Comparison of anti-Xa versus activated partial thromboplastin time (aPTT) monitoring of unfractionated heparin after vascular surgery: a single-center retrospective study

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Purpose: Vascular surgery patients often require anticoagulation with intravenous unfractionated heparin (UFH). According to the 2012 American College of Chest Physicians guideline on parenteral anticoagulants, both anti-Xa and aPTT values vary in their responsiveness to heparin, and more research is needed to identify the optimal approach for monitoring UFH therapy. A higher incidence of bleeding events was noted in vascular surgery patients when UFH infusions were monitored via anti-Xa levels compared to aPTT values at our institution. The purpose of this study was to compare the two monitoring strategies in terms of major bleeding events in the vascular surgery population.

Methods: The institutional review board (IRB) deemed this study a quality assurance initiative, and IRB review was not required. A single center retrospective chart review of vascular surgery patients who received a pharmacy managed intravenous UFH protocol postoperatively was conducted. Approximately, 600 patient charts were screened from a hospital database that included patients who were admitted by a vascular surgeon or received vascular surgery consults. A total of 100 patients met our inclusion criteria of having a vascular surgical procedure and intravenous UFH therapy managed by a pharmacy protocol postoperatively. Our exclusion criteria were pregnancy, age less than 18 years, and monitoring switched from anti-Xa to aPTT (or vice versa) during same hospital stay. Fifty patients managed via anti-Xa monitored heparin protocol, from January 2013 to September 2014, were compared to 50 patients with aPTT monitoring after the reinstitution of the aPTT monitored heparin protocol at our hospital in September 2014. The primary outcome was the proportion of patients experiencing major bleeding events post-procedure. Major bleeding was defined as: bleeding in a critical area or any bleeding causing a hemoglobin drop of greater than or equal to 2 g/dL within 24 hours or leading to transfusion of 2 or more units of packed red blood cells (PRBC). Secondary outcomes

included any bleeding episodes, the number of PRBC units administered post-procedure, and thrombotic events.

Results: Major bleeding occurred in 9 out of 50 patients (18 percent) who received anti-Xa monitored pharmacy heparin protocol versus 5 out of 50 patients (10 percent) on the aPTT monitored protocol (P equals 0.38). A total of 14 patients (28 percent) experienced a bleeding episode in the anti-Xa group versus 9 patients (18 percent) in the aPTT group (P equals 0.23).

Conclusion: The use of anti-Xa levels for heparin titration did not lead to statistically significant increase in major bleeding in vascular surgery patients compared to aPTT monitoring. The clinical significance of the higher number of bleeding episodes observed with anti-Xa monitoring needs to be assessed in larger studies in order to provide further guidance in the selection of appropriate monitoring strategies.

2017 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 13-T

Poster Title: Evaluation of the SAMe-TT2R2 risk score to predict the quality of anticoagulation control in patients treated with oral vitamin K antagonists

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Purpose: SAMe-TT2R2 score have been used in predicting the quality of anticoagulation in atrial fibrillation patients to aid in decision making between direct oral anticoagulant(DOAC) and vitamin K antagonists(VKAs). However, the original description of this scale is only conducted in atrial fibrillation patients. The purpose of this study is to assess and compare the capacity of SAMe-TT2R2 score in predicting the anticoagulation outcome in patients with atrial fibrillation, venous thromboembolism, prosthetic valves or other indications initiating oral anticoagulation therapy with vitamin K antagonists.

Methods: We conducted a retrospective cohort study of patients at Hennepin County Medical Center at Minneapolis, Minnesota, with indications for long-term oral vitamin K antagonists. Time in therapeutic range (TTR) was used as the measurement of anticoagulant quality from the preceding one year of treatment. The association between SAMe-TT2R2 score and low time in therapeutic range (less than or equal to 65 percent) was assessed by binary logistic regression analysis with the cutoff point of SAMe-TT2R2 is 2. Patients were stratified per their indications to four groups: atrial fibrillation, venous thromboembolism, prosthetic valves implementation and other indications. The validity of SAMe-TT2R2 score was assessed within each group. All statistical analysis was performed with R (version 3.1.1). This study was determined to be out of research jurisdiction by institutional review board at Hennepin County Medical Center.

Results: Of total 156 patients (age 32 to 84, 61 percent are male), 54 were atrial fibrillation patients, 52 were venous thromboembolism patients, 27 were prosthetic valve patients and 23 were patients with other indications on vitamin K antagonists. The binary regression coefficient of all patient was -2.83(P equals 0.004). Similar trends had been found in atrial fibrillation group with coefficient of -1.87(P equals 0.06) and prosthetic valve group with coefficient of -2.36(P

equals 0.018). However, the trend was not highly correlated in venous thromboembolism group with coefficient of -1.27(P equals 0.2). Chi-square test also showed less independency for venous thromboembolism group (P equals 0.81) compared with other groups (P equals 0.34 for atrial fibrillation, P equals 0.05 for prosthetic valve replacement, P equals 0.15 for all).

Conclusion: SAMe-TT2R2 score presents acceptable tool to facilitate decision-making process to optimize the anticoagulant control for atrial fibrillation. It also has the potential to predict anticoagulant quality for prosthetic valve replacement patients but may not be useful for venous thromboembolism patients.

2017 Summer Meetings Poster Abstracts

Submission Category: Clinical Services Management

Session-Board Number: 14-T

Poster Title: Vanguards of value: implementation of a chemotherapy and biotherapy stewardship program

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Purpose: Chemotherapy and biotherapy represent costly components of oncology care. These medications undergo intense scrutiny by health system formulary specialists, payers, and providers to ensure high value within the oncology care model. Innovation continues to drive the development of new agents resulting in more fast-track, accelerated, and priority regulatory approvals than any other class of medication. Strategies to guide this medication use within a health system through formulary management are effective but require specialized support due to the complexities of care. Implementation of a chemotherapy and biotherapy stewardship program to standardize medication use will promote safe and cost-effective patient care.

Methods: The objectives of this project were to identify instances of "convenience dosing" and to standardize processes associated with chemotherapy and biotherapy convenience dosing. The term "convenience dosing" is used to describe formulary products restricted to outpatient use that are administered in the inpatient setting for a patient who was admitted under a diagnosis code unrelated to an indication or complication necessitating chemotherapy or biotherapy administration. A team consisting of oncology pharmacists, a drug information pharmacist, and a pharmacy resident was established to collaborate with oncology providers to achieve the objectives. Instances of convenience dosing over a 21 month period between January 1, 2015 and September 30, 2016 were retrospectively identified and validated through a descriptive study identifying chemotherapy and biotherapy medications with an outpatient formulary restriction. Costs associated with inpatient administration of these medications were compared with costs associated with outpatient administration. Pharmacist perceptions of

convenience dosing were assessed via electronic survey to serve as a baseline for assessment of future interventions.

Results: A total of 44 medication doses met the definition of convenience dosing, of which 16 were validated as inappropriate for inpatient use. Nivolumab (4/16) and cetuximab (4/16) were the medications most frequently implicated for convenience-use, followed by paclitaxel (3/16), carboplatin (3/16), panitumumab (1/16), and ixabepilone (1/16). Potential cost savings were estimated to be $24,000 if these medications were utilized within the appropriate formulary restriction. Prior to process changes, pharmacists disagreed that enough time was allotted to assess convenience dosing, providers had appropriate expectations regarding the time required to process a convenience dose requests, and recommendations to providers who order convenience-dosed medications are based on pre-defined criteria. A pharmacy-specific process to assist inpatient pharmacists in triaging, approving or denying, and documenting convenience dosing at Froedtert & the Medical College of Wisconsin was developed. To guide future medication use toward outpatient settings, education was provided to physicians to align value perspectives.

Conclusion: Inappropriate use of restricted chemotherapy and biotherapy occurred in the inpatient setting despite traditional formulary management techniques. A dedicated stewardship team of oncology and drug information specialists has the potential to reduce inappropriate medication use, reduce medication costs, and improve pharmacists' perceptions of chemotherapy and biotherapy medication use processes.

2017 Summer Meetings Poster Abstracts

Submission Category: Clinical Services Management

Session-Board Number: 15-T

Poster Title: Use of a dashboard for monitoring clinical pharmacy services in a large medical center

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Purpose: A dashboard is a management tool that provides a quick, visual picture with displays or tables depicting select measures and is representative of the functioning of a business entity or division over a period of time. To qualify for use in a dashboard, items being measured should be easy to measure, reflect desired goals, account for fluctuations in populations, can clearly show current status or trends, and allow for predictions. The purpose of this report is to describe the use of a dashboard used to monitor and set goals for diverse clinical services in a large medical center pharmacy department.

Methods: Fourteen measures of clinical pharmacy services in a 616-bed medical center were chosen based on desired hospital improvement targets. Four assessed elements of antimicrobial stewardship (interventions resulting from Emergency Department culture reviews, vancomycin discontinuation in patients with culture-negative neutropenia, antibiotic discontinuation on medical/surgical care unit, and reducing overall usage of piperacillin/tazobactam) and 4 measures assessed patient medication education (renal transplant patients, patients starting warfarin, any patient on anticoagulants, and any education). The remaining were measures of critical International Normalize Ratio (INR)values resulting from pharmacy dosing service, analgesia and sedation medication reviews and pro-active interventions, defects associated with admission reconciliation for renal transplant patients, elimination of inappropriate stress ulcer prophylaxis (SUP) on intermediate and acute neurology units, and parenteral antihypertensive drug selection. Four dashboard items were measured hospital-wide, three focused on the critical care units, two for renal service and the remaining 5 were unit-specific. Target goals for each dashboard measure were based on desired performance and past activity. Fifteen monthly measurements for the 14 activities, adjusted for patient census, were recorded from October 2015 to December 2015. To provide a quick visual status and trend analysis, each monthly box was colored green, yellow or red representing either the specific measure is meeting or exceeding the goal, or is within about 10-20% of the goal, or exceeds 20% of the targeted goal, respectively.

Results: Over the 15 month period, seven of the 14 clinical measures showed no change, 6 met or exceeded their goals, and one showed a trend away from the goal. Two measures essentially met or exceeded theirs goals (All med education and critical INRs) and two failed to meet their goals (SUP discontinuation and antihypertensive selection) for the entire study period. Out of the 189 total monthly measurements, 85 month scores met or exceeded the desired goal (Green), 66 scores did not meet the goals by more than 20% (Red), and 38 scores were within 10% of the desired goals (Yellow). Factors that influenced the outcomes included overall workload volume, lower prioritization of these services, and pharmacist limitations in influencing specific outcomes. Review of goals and changes should be considered for measures showing little or no change.

Conclusion: Dashboards provide a unique method of displaying and evaluating the status of a pharmacy's clinical services provided throughout a medical center. This 15-month report displays 16 selected measures that were used by hospital and pharmacy management, including pharmacy staff, to set desired clinical goals and to quickly assess their status over time.

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 16-T

Poster Title: Validity of a combination therapy of daclatasvir and asunaprevir in patients with chronic hepatitis C genotype 1b

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Purpose: Conventional chronic hepatitis C virus infection was treated with pegylated interferon in combination with ribavirin. The advent of recent direct-acting antiviral agents (DAA) has led to treatment without pegylated interferon. DAA is an orally delivered drug with ease of administration. The advantage of DAA is that it can also be used for patients who have had experience with a pegylated interferon treatment. This study attempts to assess the combination therapy of daclatasvir and asunaprevir in patients with chronic hepatitis C virus genotype 1b by evaluating therapeutic efficacy and measuring patient compliance to drug administration.

Methods: This retrospective study included 22 inpatients who had been prescribed with a regimen of daclatasvir 60 mg once a day and asunaprevir 100 mg twice daily during the period from October 2015 to June 2016. Patients' statistical characteristics, prescription content, values from blood test, HCV genotype, presence of gene variation (NS5A-RAV), and experience of previous treatment were obtained from the electronic medical records. The efficacy of the combination therapy was evaluated through finding undetectable HCV RNA on the 12th week of treatment, achieving a sustained viral response for 12 weeks (SVR12). In an effort to measure compliance to drug administration targeting patients who completed drug administration for 24 weeks, Morisky Medication Adherence Scale-6 (MMAS-6) was used for conducting a telephonic questionnaire.

Results: Liver cirrhosis was found in 10 patients. All 21 patients who underwent gene mutation testing were shown to be negative, and a mutation test was not carried out for 1 patient. Eight (8) patients had no previous treatment. Seven (7) out of 14 patients with a previous treatment recurred, while the remaining 7 patients either did not respond to treatment or discontinued treatment due to an adverse reaction. The mean HCV RNC level for patients at baseline was 6.46 log IU/mL, while HCV RNA was undetectable for 19 out of 22 patients (86%) at 4 weeks of DAA administration. HCV RNA was undetectable for all patients at 12 weeks. The mean score of patients' compliance to drug administration for 19 patients who responded to MMAS-6 questionnaire was 5.58 points out of 6 points total.

Conclusion: This study confirmed the outstanding therapeutic effect of a combination therapy of daclatasvir and asunaprevir in patients with chronic hepatitis C genotype 1b. Excellent therapeutic effect can be attained through having strengthened drug administration guidance for patients undergoing DAA administration in the early phase of treatment. No patient showed any adverse reaction sufficient enough to discontinue drug administration, while the levels of patients' compliance to drug administration were measured high in both categories of "motivation" and "knowledge."

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 17-T

Poster Title: Hypoglycemic effect of dapagliflozin and the validity of its prescription for outpatients with diabetes mellitus

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Purpose: Dapagliflozin is a drug, introduced for the first time in the world, belonging to the class of sodium glucose co-transporter (SGLT) 2 inhibitors. Pharmacologic characteristics of sodium glucose co-transporter (SGLT) 2 inhibitors decrease blood glucose independently of insulin sensitivity or secretory capacity. Furthermore, glucose drained from the body increased to attain caloric reduction of approximately 200-300 kcal, which makes one to anticipate the effect of body weight decline. This study attempts to examine the current circumstances of dapagliflozin utilization and assess clinical efficacy of newly-prescribed dapagliflozin among diabetic patients before and after administration.

Methods: This retrospective study investigated the medical records of outpatients with diabetes mellitus, who had been prescribed dapagliflozin for the first time at this medical center from October 1, 2015 through May 31, 2016. This investigation analyzed (1) appropriateness of the drug's prescription (strength of the dose, the frequency of administration), (2) substitution or addition of any active ingredient, and also (3) compared and analyzed the effect of hypoglycemic effect and body weight change before and after three months of drug administration. Additionally, this study analyzed adverse reactions during the period of drug administration. A total of 63 outpatients were prescribed with dapagliflozin during the study period. Of these patients, 52 subjects undertook a blood test to get HbA1c measurement.

Results: The strength of a dose and frequency of administration were all appropriate. 26 patients(50%) were prescribed with dapagliflozin in addition to their currently-administered

hypoglycemic agent. 26 patients(50%) were prescribed dapagliflozin to substitute a specific active ingredient. In the analysis of HbA1c change targeting the group with only patients for whom dapagliflozin had been added, the mean HbA1c levels before and after dapagliflozin administration were 8.971.08% and 8.271.20%, respectively. Statistically, the mean HbA1c level significantly decreased($p < .001$). However, in the group of patients with administration of dapagliflozin, substituting their existing antidiabetic medication, their mean HbA1c levels before and after dapagliflozin administration were 7.941.80% and 7.821.19%, respectively. It showed no significant change of HbA1c levels before and after dapagliflozin administration in this group($p=0.305$). The total of 63 patients who had been prescribed with dapagliflozin, 14 patients showed a decrease in their body weight after dapagliflozin administration, showing a mean body weight decrease of 5.214.55kg. Among the total of 63 patients who received dapagliflozin prescription, a total of 11 cases developed adverse reactions during the period of administration, which included 7 cases with dehydration, 1 case with constipation, 1 case with nausea, 1 case with rash, and 1 case of fatty liver.

Conclusion: The clinical effect was more remarkable in the dapagliflozin-added group, as opposed to the group for which their existing hypoglycemic agent was substituted with dapagliflozin. The effect of body weight reduction could also be verified. However, it is not easy to make an objective decision of dehydration, which is the most frequently reported adverse reaction. It is necessary to consider a somewhat ambiguous aspect of differentiating dehydration from the symptoms of diabetes mellitus. Therefore, the consideration is that further heightened monitoring, such as drug administration consultation by a pharmacist, is necessary for all the patients with a prescription for dapagliflozin.

2017 Summer Meetings Poster Abstracts

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 18-T

Poster Title: Evaluation of the use of new oral anticoagulants (NOAC) in the outpatient setting

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Purpose: The insurance coverage of new oral anticoagulants (NOACs) has expanded in Korea since July 1, 2015, leading to a significant increase in prescription frequency. Compared with warfarin, the advantages of NOACs are no compulsory monitoring and low potential for drug-food interaction. However, owing to high rate of renal excretion, the NOACs require dose adjustment, and their use is restricted in patients with severe liver disease because the drugs are metabolized by the liver. This study was conducted to assess the adequacy of prescribing NOACs for each patient in the Cardiology and Neurology departments for 1 year from July 1, 2015.

Methods: We reviewed electronic medical records from July 1, 2015 through June 30, 2016 to conduct a retrospective analysis of the appropriateness of NOACs prescriptions (dabigatran, rivaroxaban, and apixaban) in the outpatients group of Cardiology and Neurology departments.

Results: Of the 1,626 adult patients included in this study, 1,380 patients were from the Department of Cardiology and 246 patients were from the Department of Neurology. Seven hundred and eighty-two patients were prescribed rivaroxaban, 641 apixaban, and 203 dabigatran. Among the patients included for the study, 1,547 patients had nonvalvular atrial fibrillation, 57 patients had deep vein thrombosis and pulmonary embolism, and 22 patients had other diseases. Most patients were received prescriptions for approved indications. Renal function tests (SCr, eGFR) were performed in 103 of patients prescribed dabigatran (50.7%), 517 of patients prescribed rivaroxaban (66.1%), and 402 of patients prescribed apixaban (62.7%). The number of patients with calculable CrCl was 95 on dabigatran (46.8%), 494 on rivaroxaban (63.2%), and 386 on apixaban (60.2%). Liver function tests (AST/ALT or total bilirubin) were performed in 485 of patients prescribed rivaroxaban (62.0%) and 388 of patients

prescribed apixaban (60.5%). An appropriate dosage was prescribed in most patients; however, 29 patients (14.3%) were prescribed dabigatran, 22 patients (4.5%) were prescribed rivaroxaban, and 4 patients (1.0%) were prescribed apixaban required dosage re-evaluation.

Conclusion: As a result of evaluating the adequacy of prescribing NOACs in patients with renal and hepatic lab test data, the appropriate dosage was prescribed to a majority of the patients, but some patients were over-prescribed. Due to the potential adverse effects of drugs such as bleeding and the relatively less experience of clinicians using NOACs rather than warfarin, close monitoring should be required. For safer use of NOACs, efforts should be made to strengthen prescription monitoring of pharmacists and to provide accurate drug information to healthcare providers.

Submission Category: Drug-Use Evaluation/ Drug Information

Session-Board Number: 19-T

Poster Title: Optimization of oral vitamin K formulations within an academic medical center

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Purpose: Oral vitamin K is a commonly utilized medication within the University of Virginia Health System (UVAHS). Due to the high cost and significant financial impact as a result of purchasing vitamin K tablets, consideration was given to alternate formulations of oral vitamin K that might be offered within the health system, such as use of an oral suspension. This initiative was designed streamline vitamin K product offerings, to improve safety through reduction of product manipulation, and to minimize medication expenditures related to the procurement of vitamin K tablets by converting to a compounded oral suspension.

Methods: The first phase of this initiative consisted of gathering data to compare the clinical effects of various oral formulations of vitamin K. Additionally, literature was reviewed to identify compounding recipes for a vitamin K oral suspension that would be feasible to implement at UVAHS. The second phase of this initiative consisted of project implementation. An analysis was conducted to determine the most commonly ordered doses of vitamin K over a 12 month time frame such that dosing standardization could take place. The corresponding electronic medical record was also updated to incorporate use of the oral suspension. The last phase of this initiative involved education of staff. This phase consisted of an update to educational resources and directed education to various groups within the medical center. Efficacy of the implemented changes was assessed through analysis of ordered doses and corresponding drug expenditure.

Results: A compounding recipe was identified which utilized vitamin K ampules in combination with simple syrup to prepare an oral suspension. After review of the most commonly prescribed vitamin K doses ordered at UVAHS, it was determined that 1 mg and 5 mg vitamin K oral syringes would be batch prepared such that they could be readily available both in the inpatient pharmacy and in automated dispensing cabinets to facilitate rapid retrieval. The transition from vitamin K tablets to the compounded oral suspension occurred in November 2016. Based on a financial assessment, the cost per tablet was approximately three times greater than the cost of

the same dose of the oral suspension. Based on historical tablet utilization, an annual savings of $83,000 is expected with this conversion.

Conclusion: Transition of oral vitamin K doses from a tablet to a compounded oral suspension has resulted in product optimization and improved patient safety as well as cost savings within the health system.

2017 Summer Meetings Poster Abstracts

Submission Category: Emergency Medicine/ Emergency Department/ Emergency Preparedness

Session-Board Number: 20-T

Poster Title: Reduced dosing strategy of four-factor prothrombin complex concentrate (4F-PCC) for the reversal of warfarin: An evaluation of efficacy

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Purpose: The package insert for 4F-PCC recommends a dosing algorithm based on the pre-administration International Normalized Ratio (INR) and patient weight for the reversal of warfarin. Previously published studies have demonstrated that a lower fixed dose of 4F-PCC is effective; however, the ideal dose of 4F-PCC has yet to be determined. Our institution implemented a lower dosing strategy, based upon a stratified pre-administration INR level and body weight. The purpose of this study is to evaluate the efficacy of our dosing strategy.

Methods: This retrospective chart review examined 145 patients who were administered 4F-PCC between the dates of September 2014 and September 2016 for the reversal of warfarin anticoagulation. Patients were excluded if 4F-PCC was administered during a massive transfusion protocol, if patients were on pharmacologic anticoagulation other than warfarin or if patients were pregnant during the time of administration of 4F-PCC. Patient demographics, dose of 4F-PCC administered, indication for warfarin anticoagulation and reversal, administration of phytonadione with or without fresh frozen plasma, as well as, baseline and resulting INR were all analyzed. The primary outcome was efficacy defined as a reduction in INR to a target of less than or equal to 1.5 for intracranial hemorrhage, and less than or equal to 2 for all others. Secondary outcomes include: death and adverse events (bleeding and thrombotic events) within thirty days of 4F-PCC administration.

Results: Of the 145 patients reviewed, 65 patients were enrolled for evaluation of 4F-PCC dose for the reversal of warfarin. The average pre-administration INR was 4.1 (ranging from 2 to greater than 10.9), and the average post-administration INR was 1.6 (ranging from 1.1 to 3.8). Of the 65 patients enrolled in the study, 17 had intracranial hemorrhages. Sixteen of the 17

patients (94%) had a post-administration INR less than or equal to 1.5, with the average post-administration INR of 1.3. Forty eight of the enrolled patients had non-central nervous system bleeds or surgical needs for reversal of INR. Forty three of the 48 (89.5%) had a post-administration INR of less than or equal to 2, with the average post-administration INR of 1.6. The average time from administration of 4F-PCC to INR blood drawn was approximately 4 hours. The average dose administered was 1,600 units. Fifty two patients received phytonadione in addition to 4F-PCC with 7 of those patients receiving fresh frozen plasma, phytonadione and 4F-PCC. Three patients developed a thrombosis within 30 days post administration, and 15 patients died from various causes of death following 4F-PCC administration.

Conclusion: The dosing strategy of 4F-PCC for the reversal of warfarin anticoagulation used at our institution is successful in reducing the INR to goal levels in patients presenting with the need for urgent reversal of warfarin. While the optimal dose of 4F-PCC has yet to be established, this reduced dosing strategy of 4F-PCC could be implemented at other medical centers as it effectively reduces the INR with less required medication. This in turn could potentially reduce adverse events and costs associated with treatment. A larger trial may be needed to determine the association between reduced dose and adverse event rates.

2017 Summer Meetings Poster Abstracts

Submission Category: Emergency Medicine/ Emergency Department/ Emergency Preparedness

Session-Board Number: 21-T

Poster Title: Conversion from the Alaska-1 Disaster Medical Assistant Team Pharmacy Cache to the Alaska Assistant Secretary for Preparedness and Response Pharmacy Cache

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Purpose: To implement the conversion from a Disaster Medical Assistance Team (DMAT) Pharmacy Cache to an Assistant Secretary for Preparedness and Response (ASPR) Multi-functional Pharmacy Cache in a geographically isolated area.

Methods: Local U.S. Public Health Service (USPHS) pharmacists were assigned to regularly maintain the pharmacy cache coordinating with Department of Health and Human Services (HHS), Office of the Surgeon General, ASPR, Office of Emergency Management (OEM) and Mission Support Centers in California and Maryland. In 2016 the Alaska USPHS team of pharmacists was tasked to convert the initial AK-1 DMAT pharmacy package into ASPR Multi-functional Pharmacy Cache.

Results: Since the installation of the first AK-1 DMAT pharmacy package, the work of the Alaska USPHS officers and AK-1 DMAT staff has saved ASPR approximately $100,000 (~$25,000/rehabilitation). The conversion to the ASPR Multi-functional Pharmacy Cache contributes to stream-lining emergency response processes as well as contributing to HHS anticipated cost-savings of $800,000 nationwide.

Conclusion: Local USPHS pharmacists contributed to the HHS cost-savings mission by stream-lining emergency response processes and implementing the conversion from a DMAT Pharmacy Cache to an ASPR Pharmacy Cache in a geographically isolated area.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 22-T

Poster Title: Implementation of a Protocol for Naloxone Distribution to Hospital In-Patients at High Risk for Opioid Overdose

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Purpose: The Centers for Disease Control and Prevention (CDC) reported that from 2000 to 2014, the rate of overdose deaths involving the use of opioids increased by 200%. The use of in-home naloxone has been suggested as a strategy to address this epidemic. This involves access to naloxone combined with patient education about appropriate use. For this reason, we sought to implement an inpatient naloxone protocol in our community teaching hospital. This protocol differs from those implemented in emergency departments or outpatient clinical settings as it utilizes resources associated with inpatient hospital admissions.

Methods: : The protocol targets patients admitted to an inpatient medical unit who have a history of addiction to opioids or overdose related to the use of illicit or prescription opioids. An interdisciplinary team of health care providers was assembled, including members representing medicine, pharmacy, social work, and clinical informatics. Meetings were held approximately monthly to review the institution's existing protocol for dispensing of naloxone to patients treated solely in the emergency department, as well as develop the procedure and educational components for this endeavor. It was mutually agreed upon that the initial phase of implementation of such a protocol would focus on the population of patients with known or suspected substance abuse issues, with a secondary phase focusing on targeting chronic pain patients. An interdisciplinary grand rounds seminar was held for all staff, which reviewed the proper identification of an opioid overdose, placing the patient in a safe position, and assembly of the naloxone nasal kit using the teach-back technique. A follow-up competency evaluation was performed for staff intended to be involved in the protocol. The clinical informatics department was heavily involved throughout the development phase, as the protocol relies on the electronic medical record system for all documentation. A small group of pharmacy student

interns were selected to participate in the implementation of the protocol, and also received appropriate training.

Results: The protocol was approved by the hospital's Pharmacy & Therapeutics Committee and initial use began in October 2016. The process requires physicians to identify a patient based on past opioid use and abuse, current rehabilitation status, or current opioid overdose treatment. Once a patient is identified, the physician enters an order in the computerized order-entry system, which sends a notice to pharmacy. Before the patient is discharged, the patient's nurse plays the approved naloxone/overdose training video to the patient. A pharmacist or pharmacy student is then able to bring the patient a take-home kit made in the pharmacy, which includes two intranasal naloxone syringes with two atomizers and patient information pamphlets. The pharmacy representative educates the patient and/or caregiver using a Savelives Intranasal Naloxone Trainer to ensure the patient understands how to assemble the kit and use it properly and how to respond to an overdose. If a pharmacy representative is not available, a staff member from Social Services is then called upon to complete the patient/caregiver education. Once all activity is completed, the electronic form is documented in the patient's profile. A member from Social Services makes a follow-up phone call to the patient approximately 30 days after discharge.

Conclusion: Implementation of an in-home naloxone protocol such as ours allows us to reach patients who might otherwise have been missed by community- or emergency department-based naloxone protocols. Since implementation has occurred successfully, our next step is to evaluate the impact of this protocol, including any missed patient identification opportunities, potential system barriers, and evaluate information gathered by the 30-day follow-up phone calls.

Submission Category: General Clinical Practice

Session-Board Number: 23-T

Poster Title: Expanding pharmacy practice through advanced pharmacy certification at the Alaska Native Medical Center

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Purpose: To expand pharmacy practice through advanced pharmacy certification at the Alaska Native Medical Center (ANMC).

Methods: A pharmacy team was created to review existing programs and identify areas for improvements based on current clinical guidelines. The team revamped ANMC's existing programs to meet the critical elements criteria to enhance safety, increase pharmacist job satisfaction and provide uniform clinical competency. These protocols authorize the pharmacists to adjust the dose of several intravenous antibiotics (ex. vancomycin, gentamicin) and anticoagulants as well as monitor laboratory values. The team presented protocols to the ANMC Pharmacy and Therapeutics (P&T) Committee. Pharmacist competencies were updated to solidify and document understanding of the protocols. The team educated medical staff on pharmacist managed protocols.

Results: Four protocols were reviewed, updated and approved by ANMC P&T Committee. One competency was created and two others were updated and implemented. Twelve pharmacists were certified in inpatient pharmacokinetics, three pharmacists were certified in ambulatory pharmacokinetics, and ten pharmacists were certified in inpatient anticoagulation. Nine hundred patients benefited annually for inpatient pharmacokinetics, 25 patients benefited for ambulatory pharmacokinetics, and 720 patients benefited for inpatient anticoagulation.

Conclusion: The ANMC pharmacy team reviewed and updated existing programs in anticoagulation and vancomycin and aminoglycoside antibiotic therapy to enhance safety and uniform clinical competency. These programs expanded pharmacy practice through advanced pharmacy certification.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 24-T

Poster Title: Palatability of cocoa-flavored gummi drug of aripiprazole developed from commercially available tablets

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Purpose: Patients with schizophrenia who often have poor medication adherence could easily take gummi drugs daily resulting in improvement of their therapy. Because gummi drugs are chewed, drugs with an unpleasant bitter taste in gummi formulations may result in poor adherence. In this study, we developed a cocoa-flavored gummi drug containing aripiprazole (ARP) from commercially available orally disintegrating tablets (ODTs) of ARP. We aimed to clarify the palatability of gummi drugs of ARP by performing gustatory sensation test in healthy volunteers.

Methods: For preparing ARP gummi drug, hydrochloric acid, gelatin solution, and ARP ODTs were added to hydrogenated maltose starch syrup (Amalty Syrup) and D-sorbitol solution. The mixture was evaporated and dispensed into a plastic plate (6.0 mg of ARP/3.5 g of gummi drug) by using a syringe and cooled for 24 h. We prepared four types of ARP gummi formulations as follows: formulation without organoleptic masking agents (ARP-G); with aspartame (2 percent, A-ARP-G); with cocoa powder (0.5 percent) and flavor (0.5 percent, CF-ARP-G); and with a combination of aspartame, cocoa powder, and flavor (ACF-ARP-G). A gustatory sensation test was performed in 10 healthy adult volunteers (age, 23.7 plus or minus 1.2 years [means plus or minus S.D.]) after obtaining written informed consent. The volunteers chewed each gummi drug in their oral cavities, and then spat out the drug. We used the 100 mm visual analog scale (VAS) to evaluate bitterness, sweetness, and the overall palatability of ARP-G, A-ARP-G, CF-ARP-G, and ACF-ARP-G. The volunteers had to place a mark along the scale while chewing and just after spitting out the drugs. VAS scores of 100 corresponding to bitterness and sweetness meant "very bitter," and "very sweet," respectively, whereas VAS scores of 100 corresponding

to overall palatability meant "good." The study protocol was approved by the Ethics Committee of Hamamatsu University School of Medicine, Japan.

Results: We developed a cocoa-flavored gummi drug of ARP from commercially available ARP-ODTs. The pharmaceutical characteristics of ARP-G were demonstrated to be suitable for hospital formulations, and it could be stored for 1 month. No significant differences were observed in the dissolution and pharmacokinetics of ARP-G fractions, which were assumed to be formed by chewing, when compared with those of ARP tablets. In the gustatory sensation test, the VAS scores of bitterness while chewing the gummi drugs did not differ among the different formulations. All types of ARP formulations with organoleptic masking agents (A-ARP-G, CF-ARP-G, and ACF-ARP-G) showed higher VAS scores than ARP-G. The VAS scores of bitterness of A-ARP-G and ACF-ARP-G were significantly lower after spitting out the gummi drugs, while the VAS scores of sweetness were significantly higher than that of ARP-G. The VAS scores of overall palatability of ACF-ARP-G both during chewing and after spitting out were the highest among all gummi drugs tested and significantly higher than those of ARP-G.

Conclusion: We were able to develop a cocoa-flavored gummi drug of ARP possessing good palatability from commercially available tablets. Therefore, ARP gummi drugs will be acceptable to patients and help improve their medication adherence.

2017 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 25-T

Poster Title: Evaluation of statin therapy in stable liver disease population

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Purpose: The objective of this study is to evaluate statin therapy prescribing patterns and compliance to the 2013 American College of Cardiology/American Heart Association (ACC/AHA) Blood Cholesterol guideline recommendations in a liver disease population at the Michael. E. DeBakey Veterans Affairs Medical Center (MEDVAMC). Patients with liver disease are at higher risk of cardiovascular events compared to the general population, demonstrating an area where statins can have a significant positive impact in cardiovascular event prevention. Despite the notable benefit, providers may be reluctant to start or continue statin therapy for liver disease patients because of the concern for hepatotoxicity.

Methods: A retrospective chart review of statin use in adult patients with stable liver disease was conducted. Patients were identified via hepatology clinic records and assessed for a two-year timeframe following a clinic visit. Using the computerized patient record system, appropriate statin therapy was determined in accordance with the 2013 ACC/AHA guidelines. Patients included were those age >18 years old with stable liver disease who received care at the MEDVAMC hepatology clinic from May 1, 2014 through August 31, 2014. Exclusion criteria included decompensated liver disease in the previous 90 days, documented history of allergy to statin or statin-induced rhabdomyolysis, adults >76 years old, absence of lab work within prior two years, and acute liver failure. Mortality, cardiovascular, and liver outcomes were assessed. Data collected included patient characteristics, comorbidities, liver disease etiology, liver disease treatment escalation, liver disease decompensation, hospitalizations, statin therapy, MELD scores, and lab work including ALT, AST, INR, albumin, bilirubin, and lipid panels. Statistical analysis includes descriptive statistics. All data was collected without patient identifiers and maintained confidentially. The study has been approved by the Institutional Review Board and Research and Development.

Results: Of 222 patients screened, 192 patients were included in the study. Exclusion criteria included liver decompensation (n=15), age >76 years (n=6), no lab work within two years (n=3), seen for non-liver disease (n=3), missed appointment (n=2), and statin allergy (n=1). Included patients were 59.5 (8.5) years old, 97.4% male, and 50% white. Baseline MELD score was 7 3.95 and 10-year ASCVD risk was 13.15% 11.7%. Stable liver disease included hepatitis c virus (67.7%), liver disease secondary to alcohol use (51.0%), and nonalcoholic fatty liver disease (26.6%). Multiple liver diseases occurred in 53.6% patients. Statin therapy was indicated in 156 patients, 24 patients (15.4%) were prescribed the correct statin therapy, and 16 patients (10.3%) were prescribed suboptimal statin therapy per 2013 ACC/AHA guidelines. Nine patients had documented reasons for statin avoidance, which included cirrhosis diagnosis, elevated LFTs, hepatitis c virus, and LDL < 40). Hepatic outcomes (n=38) included 18 clinic visits, 10 emergency department visits, and 23 hospitalizations. Cardiovascular outcomes (n=4) included three clinic visits, two emergency room visits, and four hospitalizations. The incidence of statin intolerance was 2.6%, and included rhabdomyolysis, muscle weakness/pain, and elevated LFTs. Data collection will continue with a target sample of 250 patients.

Conclusion: Despite evidence of beneficial statin therapy effects in stable liver disease patients, appropriate statin therapy prescription rates based on the 2013 ACC/AHA guidelines remain low. The most common documented reasons for statin therapy avoidance cited in this study included cirrhosis diagnosis, elevated LFTs, and hepatitis c virus. Providers should be conscious that liver patients are indicated for statin therapy and can be safely maintained on statins with proper monitoring. Providers should be screening liver disease patients to better comply with current guidelines for this at-risk population.

2017 Summer Meetings Poster Abstracts

Submission Category: Geriatrics

Session-Board Number: 26-T

Poster Title: Prevalence of cognitive impairment in elderly patients upon hospital admission detected by Mini-Cog assessments performed by pharmacy students

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Purpose: Hospitalized patients with cognitive impairment may have difficulty understanding medication education provided by healthcare workers and are at increased risk for hospital readmission. Mini-Cog is a validated assessment tool that can be used to detect cognitive impairment in approximately 3 minutes with minimal training. This study evaluates the feasibility of using pharmacy students to perform Mini-Cog assessments and estimates the prevalence of cognitive impairment within 24 hours of hospital admission.

Methods: This prospective, single-center study enrolled patients aged 65 years and older admitted from the Emergency Department to Houston Methodist Hospital from February 2017 to March 2017. Patients were excluded if they had neuromuscular abnormality (unable to use hands to write), had vision or hearing difficulties, were non-English speaking, were on isolation for infection, or were admitted to psychiatric or intensive care units. Fourth year pharmacy students on Advanced Pharmacy Practice Experience rotations were trained to administer Mini-Cog assessments following completion of a pre-specified training program. Training consisted of a didactic lecture with case based scenarios, 2 video presentations, and bedside practice sessions facilitated by pharmacists who had successfully completed the same training protocol under the supervision of geriatrician content experts. The primary endpoint was cognitive impairment defined as a Mini-Cog scores of 3 or less. The primary outcome was the prevalence of cognitive impairment among elderly patients (age ?-65) within 24 hours of hospital admission from the Emergency Department. Secondary outcomes includes the average number of observed Mini-Cog practice assessments required for pharmacy students to meet the competency requirements to assess feasibility and the presence of a caregiver at bedside at the time of patient assessment.

Results: Of 548 patients screened, 309 were selected using a simple randomized sample, and 98 (32%) patients (50 males and 48 females) were enrolled. The average time from hospital admission to Mini-Cog assessment was 15.6 hours (SD=5.6). The prevalence of cognitive impairment was 56% (55 of 98) and did not vary by gender (64% for males vs. 48% for females, p=0.11) or age group (53% for age < 75 vs. 61% for age ?-75, p=0.41). Among those 55 patients, 42 (76%) failed the Clock-drawing test, and from this group, only 4 patients were able to recall all the words in the Three-word recall test. A total of eight pharmacy students were trained for the project. The average number of training assessments required to become competent at performing the Mini-Cog was 4.6 (SD=1.1). Caregiver available at bedside at time of cognitive assessment was 32% (31 of 98 of patients). Among 55 patients with cognitive impairment, 22 (40%) had caregivers at bedside at time of cognitive assessment. Physicians, nurses, and pharmacists were notified of all patients with abnormal Mini-Cog results. Social workers were consulted to provide additional assistance post discharge.

Conclusion: The prevalence of cognitive impairment within 24 hours of hospital admission from the Emergency Department was 56% among patients aged 65 years and older. This high prevalence could impact on the quantity of information retained by patients during medication education sessions, especially if caregivers are not present during the pharmacy education. This study provides evidence that Mini-Cog assessments can be performed by fourth year pharmacy students during routine patient education provided on hospital rotations.

2017 Summer Meetings Poster Abstracts

Submission Category: Geriatrics

Session-Board Number: 27-T

Poster Title: Aspirin prescribing practices for primary stroke prevention in elderly women following monthly population-based clinical pharmacist evaluation

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Purpose: The United States Preventive Services Task Force (USPSTF) has recommended low-dose aspirin for primary stroke prevention in women only when potential benefit of reduced ischemic stroke risk outweighs potential harm of increased gastrointestinal hemorrhage risk. These recommendations are not consistently implemented, as evidenced by a pilot study preceding this investigation, in which only 65.3% of women ages 65 to 79 were treated or not treated according to aspirin guidelines for primary stroke prevention. This current study was designed to evaluate a newly implemented clinical pharmacist quality improvement process aimed at enhancing utility and safety of aspirin use for this indication.

Methods: This Institutional Review Board-approved observational cohort study assessed the impact of an innovative, technology-driven, population-based pharmacist care process. The study population consisted of a random sample of women ages 65 years and older who received medical care within one family medicine clinic between the dates of 9/1/2015 and 2/29/2016, as identified by electronic medical records. Exclusion criteria included documented history of cardiovascular events, current use of other anticoagulant or antiplatelet agents, and known use of aspirin for conditions other than primary prevention. The primary outcome measure, adherence to USPSTF aspirin use guidelines, was updated during the study to comply with new USPSTF guidelines released in 2016, as pre-defined in the study protocol. Based on these updated recommendations, women under age 70 were deemed reasonable aspirin candidates for this indication if their atherosclerotic cardiovascular disease (ASCVD) 10-year risk score, as determined by the pooled cohort equations calculator from the American College of Cardiology and the American Heart Association, was equal to or greater than 10%. Secondary

outcomes included time spent on the new collaborative pharmacy process and patient-level barriers to appropriate aspirin use, which were tracked manually throughout pharmacist evaluations. Descriptive statistics were utilized for baseline characteristics and analysis of study outcomes. This study was funded by a Pharmacy Resident Practice-Based Research Grant from the American Society of Health System Pharmacists (ASHP) Research and Education Foundation.

Results: In the study population of women aged 65 to 69 years (n=104), 30.8% were receiving aspirin for primary stroke prevention. Mean ASCVD 10-year risk score of the overall population was 11.3%, with a mean age of 67 years. Further analysis revealed that patients in this group who were treated with aspirin had a higher mean ASCVD 10-year risk score than those not on aspirin (15.6% versus 9.44%) despite a similar mean age (67.5 versus 66.8 years). Of patients in this population who were treated with aspirin (n=32), 78.1% were determined to be reasonable candidates for low-dose aspirin in the setting of primary prevention, while 21.9% were considered to be on inappropriate aspirin therapy. Of the patients who were not on aspirin for primary prevention (n=72), 83.3% were determined to be correctly identified as inappropriate candidates for aspirin in this setting, while 16.7% could have been reasonable candidates for this therapy. Average time spent per pharmacist review of a patient in the newly implemented quality improvement process was 2.2 minutes (range 0.5 to 10.5 minutes). Common patient-level barriers to appropriate aspirin use included medication side effects, aspirin allergy, conflicting advice from other sources, and history of gastric ulcer or bariatric surgery.

Conclusion: Over 30% of women aged 65 to 69 in this study utilized low-dose aspirin for primary stroke prevention. While guidelines for aspirin use in this population and indication are vague, reasonable candidates can be identified based on clinical evaluation and patient goals. Average pharmacist evaluation time supported the study hypothesis that the model utilized could be applicable to various patient populations as a feasible process for ongoing clinical pharmacist evaluation of appropriate medication use and safety. Pharmacists are able to play an important role in educating patients and providers on potential benefits and risks of aspirin use in primary prevention.

2017 Summer Meetings Poster Abstracts

Submission Category: Pain Management

Session-Board Number: 28-T

Poster Title: Opioid-induced nausea and vomiting is associated with suboptimal recovery and treatment satisfaction among patients with acute pain in the outpatient setting

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Purpose: Nausea and vomiting are common opioid-related side effects often associated with early treatment of acute pain. Opioid-induced nausea and vomiting (OINV) may be challenging for patients, particularly when it is not managed sufficiently. This study sought to assess the impact of OINV on patient recovery and satisfaction with opioid treatment in the outpatient setting.

Methods: A cross-sectional survey of adults who in the previous 90 days received an oral opioid-containing product for the treatment of acute pain resulting from injury or surgery (less than or equal to 14 days' supply) and with no recent prior opioid use or cancer/chemotherapy was conducted. OINV was defined as any nausea and/or vomiting that occurred during opioid use. Any changes to opioid medication use, the degree of bother associated with OINV, and the overall effectiveness in performing daily activities (0 to 100 percent) during the first week of opioid treatment were assessed. The Treatment Satisfaction Questionnaire for Medication version 1.4 (TSQM) was also administered. Chi-square tests for categorical variables and t-tests for continuous variables were used to test for significant differences.

Results: 512 patients completed the survey, 22.5 percent (n equals 115) of whom reported OINV (21.3 percent nausea; 5.9 percent vomiting). Patients with OINV were younger [mean (standard deviation) years: 38.1 (13.2) versus 44.3 (15.4)] and more likely female (83.5 percent versus 70.5 percent) compared to those with no OINV. Among patients with OINV, 68.7 percent (n equals 79) reported being at least moderately bothered by the side effect, and 49.6 percent (n equals 57) either down titrated or discontinued their opioid medication in order to manage

nausea and vomiting symptoms even though most of these patients [63.2 percent (n equals 36)] did not receive instructions from their healthcare provider to do so. Mean (standard deviation) percent effectiveness in performing daily activities was significantly lower in patients with OINV [47.3 percent (29.9 percent)] compared to those without the side effect [53.8 percent (27.8 percent); P equals 0.03]. Mean (standard deviation) treatment satisfaction scores for patients with OINV were significantly lower on the TSQM compared to those with no OINV [Global Satisfaction (64.2 (25.7) versus 75.5 (19.2)), Convenience (74.1 (19.3) versus 82.7 (15.3)), Effectiveness (62.5 (19.8) versus 71.0 (17.1)), Side Effects (55.3 (27.5) versus 81.6 (24.1)), respectively (all P less than 0.001)].

Conclusion: In the outpatient setting, management of OINV may be challenging for patients, leading to dose reductions and/or pre-mature discontinuations of opioid medication. A more proactive approach to the management of OINV may improve functional outcomes and patient satisfaction with their treatment.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 29-T

Poster Title: Intravenous immunoglobulin (IVIG) to subcutaneous immunoglobulin (SCIG) switch in US patients with primary immunodeficiency: an economic and budget impact model

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Purpose: Immunoglobulin G (IgG) therapy for primary immunodeficiency disease (PID) is primarily administered as hospital-based intravenous immunoglobulin (IVIG) or as home-based subcutaneous immunoglobulin (SCIG). Studies have shown that an IVIG to SCIG switch is associated with improved general health and quality of life. Non-US studies have indicated that SCIG might be a cost saving alternative to IVIG. The objective of this US study was to evaluate expected health plan-level budget impact, and patient and national cost impact from an IVIG to SCIG switch in patients with PID accounting for infusion costs, drug costs, and monetization of patient travel time.

Methods: In conducting this health economic analysis for the US, we incorporated changes under the recent 21st Century Cures Act, effective January 2017, which equalized the payment formula for Medicare Part B drugs to ASP basis. A decision theoretic (patient flow) based economic model was built (using TreeAge Pro) with continued IVIG or an IVIG to SCIG switch as decision choices. Model inputs included the probability distribution of treatment setting (hospital, non-hospital infusion center/medical office, or home), treatment frequency (weekly/biweekly vs. less frequent), drug costs (per gram), SCIG to IVIG dosing ratio of 1.0?"1.05 based on recent real world evidence, patient body weight, infusion costs by setting, number of infusions and number of nurse-to-patient SCIG training sessions per year, impact of frequency of infusions on patients' IgG levels, impact of sub-threshold IgG levels on risk of pneumonia, and cost of pneumonia, and for the patient perspective, time for travel and infusion, and coinsurance. For the health plan-level budget impact and the national-level cost impact, the prevalence of PID, percentage of likely antibody (humoral) deficient patients, and proportion of patients treated with each modality in the US were also incorporated.

Results: Overall, the model predicted annual cost savings to the payer of about $5,100 per patient switched from IVIG to SCIG. In addition, annual savings to the patient from reduced coinsurance and time for infusions were expected to total $2,300. The highest savings were projected to accrue from a switch from hospital-based IVIG to home-based SCIG treatment. Based on an overall PID prevalence of 1 in 1,200, eliminating 35% of patients with non-humoral deficiencies, and applying recent survey findings on percentage of patients that are currently treated with IVIG and SCIG, respectively; the model projected cost savings of $1.6?"3.9 million for a 10 million member plan, based on 10?"25% of current IVIG patients switching to SCIG. At the national level, it was projected that there would be corresponding cost savings of about $70?"176 million.

Conclusion: A switch from IVIG to SCIG in treatment of PID can be cost saving both in terms of direct payer perspective and patient perspective. Greatest savings are expected to result from switching hospital-based IVIG infusion patients to home-based SCIG treatment.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 30-T

Poster Title: Outcomes measures to evaluate effectiveness of coordinated medication management model for home care older adults

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Purpose: Collaborative medication management models have been developed to tackle the safety risks related to medications of the aged, but evidence demonstrating their effectiveness is limited (Kiiski et al. 2016, Huiskes et al. 2017). The key methodological shortcomings relate to the selection of outcomes measures and length of the follow-up period. The purpose of this study was to conduct an inventory of potential outcomes measures and to select proper measures for a randomized controlled trial (RCT) to study effectiveness of the developed coordinated medication management model (CoMM) for the aged home care clients (Toivo et al. 2017, ClinicalTrials.gov NCT 02545257).

Methods: The study was conducted in Home Care Unit in Lohja, Finland which is a part of public primary care services. For planning the RCT study design recent systematic reviews and other literature was reviewed to learn about study designs and outcomes measures rigorous for assessing effectiveness of collaborative medication management models for the aged home care clients. Furthermore, an inventory of clinical measures used in standard clinical practice in Lohja Home Care was conducted in order to include them as outcomes measures in the RCT protocol. The inventory also covered electronic screening tools for medication risk management available in Finland. The final selection of the outcomes measures was made in collaboration with Lohja Home Care considering study purposes, reliability, validity, sensitivity and specificity of measures and feasibility of carrying out the measurements in clinical practice. Measures already in use were prioritized to minimize additional work to home care nurses and practical nurses and inconvenience for the patients. ECHO model, which covers economic,

clinical and humanistic outcomes, was applied for their selection and categorization (Kozma et al. 1993).

Results: Selected study period was 2 years with measurements at baseline, at 1 and 2 years. The following clinical outcomes measures already in use in standard clinical practice in Lohja Home Care were selected: 1) functional ability and activities of daily living (RAVA), 2) physical functioning (five-times-sit-to-stand test), 3) global cognition (MMSE), 4) depression (GDS-15) and 5) malnutrition (MNA). The following three clinical measures were added: difficulties related to urination (UDI-6), presence of orthostatic hypotension (3 minutes test) and alcohol use test (AUDIT-C). The medication-specific outcomes measures include assessment of clinically significant drug-related problems by using Drug-Related-Problems Risk Assessment Tool (DRP-RAT) (Dimitrow et al. 2014) and electronic screening tools (e.g., for identifying potentially inappropriate medicines for the aged, anticholinergic and serotonergic load and clinically significant drug-drug interactions) (Bger et al. 2009, Leikola et al. 2013, AGS 2015). Use of health services is evaluated using data related to visits to physicians, use of home care services and hospital days.

Conclusion: This study produced a combination of outcomes measures that assess general health status and functional ability of the aged, but also target to specific symptoms that can be potentially caused as adverse effects of medications. Selected study period of 2 years is long enough to demonstrate potential changes in study participants' health outcomes, use of health services and sustainability of changes made in their medications to optimize it.

2017 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes Research/ Pharmacoeconomics

Session-Board Number: 31-T

Poster Title: The impact of switching from one-batch-per-day to three-batch-per-day schedule on IV medication waste due to expiration and IV medication recycling

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Purpose: The pharmacy studied the financial impact of switching from one-batch-per-day to three-batch-per-day schedule in reducing IV medication waste due to expiration and increasing recycling of IV medication.

Methods: The pharmacy followed the change in percent of IV medication waste and change in percent of IV medication recycling as the pharmacy moved from one-batch-per-day to three-batch-per-day schedule. The pharmacy tracked total IV medication compounded daily. The pharmacy tracked IV medication expired and recycled on selected dates. The percent of IV medication wasted due to expiration is calculated by dividing daily total number of expired IV medication by daily total number of IV medication compounded. The percent of recycled IV medication is calculated by dividing daily total number of recycled IV medication by daily total number of IV medication compounded. For a given day, dollar value for total IV medication expired and dollar value for total IV medication recycled are recorded. Average daily dollar value for total IV medication expired and average daily dollar value for total IV medication recycled were compared for one-batch-day and three-batch-day schedule to establish saving value.

Results: Pharmacy sampled 6 days for percent of IV medication waste due to expiration and percent of IV medication recycled during one-batch-per-day schedule. Once three-batch-per-day schedule was established, pharmacy sampled 6 days for percent of IV medication waste due to expiration and percent of IV medication recycled. Baseline and follow-up data appear in Table 1. One-batch-per-day schedule showed average daily waste due to expiration of 4.9 %

and average daily recycled IV medication of 8%. Three-batch-per-day schedule showed average daily waste due to expiration of 0.7 % (4.2 % reduction from baseline) and average daily recycled IV medication of 14% (6% increase from baseline). This resulted in average daily saving by reduced expiration of $507.37, and extrapolated annual saving of $185,189.44. Also this resulted in average daily saving by recycling IV medication of $339, and extrapolated annual saving of $123,720.40. Combined projected saving for pharmacy is $308,909.84 per year.

Conclusion: The three-batch-per-day schedule, compared with single-batch-day schedule has reduced IV medication waste due to expiration by 4.2% and increased IV medication recycling by 6%. The three-batch-per-day schedule has demonstrated that increasing the frequency of IV medication batch can lead to reduced waste of IV medication and increased recycle of IV medication. Net saving expected in pharmacy is $308,909.84 over year.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 32-T

Poster Title: Economic, Clinical and Humanistic Outcomes of a Pharmacist-led Proton Pump Inhibitor Discontinuation Safety Initiative

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Purpose: Kaiser Permanente Riverside Medical Center focuses on optimal patient care and medication safety by identifying patients at risk for adverse events and implementing safety initiatives in order to improve quality of care. The Centers for Medicare & Medicaid Services recently issued a statement noting that PPIs are widely prescribed outside of their approved product labeling for indication, age, dosage, or duration. PPIs have also been associated with serious adverse events such as Clostridium difficile, pneumonia, kidney injury, cognitive impairment and osteoporosis. This study examined the economic, clinical and humanistic outcomes of a pharmacist-led PPI discontinuation safety initiative.

Methods: A retrospective analysis was conducted at Kaiser Permanente Medical Center for the pre-intervention period from December 1, 2016- January 31, 2017 and post-intervention period February 1 - March 17, 2017. Data was abstracted and analyzed from electronic medical records. Inclusion criteria included adult patients (18 years of age and older) whose prescription PPI was discontinued during December 1, 2016 to January 31 2017, who were previously on a PPI for greater than three months for gastroesophageal reflux disease (GERD). Patients also had to have had a diagnosis of any of the following in the previous five years, Clostridium difficile, pneumonia, osteoporosis, kidney injury and dementia as identified by international classification of diseases tenth revision to meet inclusion criteria. Patients were excluded if they had a history of Helicobacter pylori infection, esophageal adenocarcinoma, erosive esophagitis and Barrett's esophagus, Zollinger-Ellison syndrome, esophageal stricture, eosinophilic esophagitis, history of esophageal dilation, history of bariatric surgery, chronic oral steroid use, chronic non-steroidal anti-inflammatory drug use or pregnant patients. Outcomes of this study included the economic, clinical and humanistic impacts of a pharmacist-led PPI discontinuation safety initiative. Percent recidivism, gastrointestinal events, descriptive statistics and t-test

comparing the average per member per month cost was conducted to assess significant changes in episode rates pre-and post-implementation by pharmacist interventions group. This study was approved by the Institutional Review Board of Kaiser Permanente.

Results: Between December 1, 2016 and January 31, 2017, 154 patients were selected to be discontinued from their proton pump inhibitor. Recidivism rate was 5.84 percent (n equals 9; p value less than 0.001), gastrointestinal events was 0 percent (n equals 0; p less than 0.001) and visits to the emergency department, urgent care or primary care physician related to a gastrointestinal event was 0.64 percent (n equals 1; p less than 0.001). The cost of per member per month decrease was also found to be statistically significant (CI 95 percent 38.24 to 46.40 p value less than 0.001). 86 percent of patients were very satisfied, 8 percent were satisfied, 2 percent were neutral, 1 percent were somewhat dissatisfied and 1 percent were dissatisfied with the proton pump inhibitor discontinuation safety initiative.

Conclusion: Inappropriate prescribing of PPIs and the total duration patients are on PPIs is a growing concern among adults in the United States. Historical practice has shown that primary care clinicians have used these medications effectively, but have often reflexively left patients on PPIs long-term, exposing patients to avoidable risks. Management of patients with GERD using a deprescribing method represents a viable strategy supported by cost-effectiveness and patient preference. From a practical standpoint, patients with GERD symptoms that remit with PPI therapy and do not have complicated disease are the best candidates for PPI deprescribing.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 33-T

Poster Title: Basic Infusion usage in integrated Alaris intravenous infusion pumps

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Purpose: Utilizing infusion pumps programmed with a medication library and dosing limits can improve patient safety. Alaris intravenous infusion pumps utilize software called Guardrails to program a medication library and dosing limits. The alternative to utilizing Guardrails on Alaris Infusion Pumps is called Basic Infusion. In 2015, Saint Luke's Health System implemented infusion pump integration technology allowing bidirectional flow of information between infusion pumps and electronic medical records. This technology provided details on Basic Infusion usage. The primary objective of this study was to analyze Basic Infusion mode usage and identify opportunities for decreasing unnecessary use of this mode of administration.

Methods: An All Infusion Detail Report was generated from the Knowledge Portal Database for infusions programmed in April 2016. This report provided the following parameters; patient identification number, pump identification number, date, time, rate of infusion, and volume to be infused (VTBI). A retrospective chart review was conducted for each infusion programmed in the Basic Infusion mode to analyze the medication, medication class, unit, shift, and user. All Basic Infusion research was granted approval by the Saint Luke's Health System Institutional Review Board.

Results: Intravenous fluids and antibiotics comprised the largest categories of medications administered in the Basic Infusion mode at 44% and 37% respectfully. Additionally, 6% of nurses used Basic Infusion greater than five times. Those 25 users accounted for 25% of total Basic Infusions that month. Lastly, Basic Infusion usage was categorized by nursing unit for each hospital.

Conclusion: The total usage of Alaris smart pump intravenous infusions without safety settings were approximately 20% in April 2016. Analysis of the All Infusions Detail Report allowed for coordinated reeducation spotlighting Guardrails usage. Intravenous fluids and antibiotics were focal points of education efforts. These endeavors provided improvement in Guardrails utilization in the months following. The nomenclature "Basic Infusion" creates a limitation due to the assumptions that common medications should be administered using the Basic infusion setting. Finally, increasing integration compliance between Alaris Infusion Pumps and patient specific electronic medical records should decrease the usage of Basic Infusions throughout the Health System.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 34-T

Poster Title: Adding melatonin to an insomnia order set: Six month evaluation

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Purpose: Many factors contribute to sleep problems in hospitalized patients yet little guidance exists for their management. We implemented an inpatient insomnia protocol and order set in 2014 to reduce sleep medication use. The protocol suggested nonpharmacologic nursing strategies until the patient reported 2 consecutive nights of poor sleep and included limited pharmacological options (zolpidem and zaleplon). Six-month post-implementation evaluation revealed a 49 percent reduction in zolpidem prescribing. In 2016, prescribers requested the addition of melatonin as a sleep aid. The purpose of this project was to incorporate melatonin into the insomnia order set and evaluate its use after 6 months.

Methods: The hospital's review board approved the study. Melatonin was incorporated into the electronic insomnia order set with dose recommendations based on patient age, prior use, and concurrent CNS depressants. A revised order set was implemented in September 2016. An electronic list was generated for all melatonin, zolpidem, and zaleplon orders prescribed within the 6-month post-implementation period. Orders prescribed in the Emergency Department, Intensive Care, and Behavioral Health areas were excluded by protocol. Order set compliance was determined by evaluating if they originated in the order set. Electronic medical records for prescribed melatonin orders were manually reviewed for a period of 2 months to evaluate doses prescribed for per protocol appropriateness and to obtain patients' responses to daily nursing sleep inquiries, "How well did you sleep last night compared to what you are used to?". The 6-month post-implementation data (2016-2017) was compared to data from the same 6-month period a year before (2013-2014) and after (2014-2015) implementation of the original order set, for prescribing trends. A comparison of the sleep assessment responses between the 2014-2015 and 2016-2017 data was conducted using the chi-square test with a predefined significance of P less than or equal to 0.05. The hospital's adverse drug event reporting system was reviewed for any melatonin-related events. A team consisting of a physician, pharmacist, and medication safety fellow evaluated the collected data.

Results: A total of 360 orders for melatonin, 521 for zolpidem, and 142 for zaleplon were prescribed during the 6-month post-implementation period for the revised order set. Compared with data from the 6-month period prior (2013-2014) and after (2014-2015) implementation of the original set, the revised data showed a reduction in zolpidem prescribing of 57 and 15 percent, respectively. Combined prescribing of melatonin, zolpidem, and zaleplon in the revised data represented a 16 percent reduction from 2013-2014, but a 28 percent increase in orders from 2014-2015. Overall order set compliance was 93 percent. No adverse drug events for melatonin were reported. Deeper evaluation of 125 records for patients prescribed melatonin between September 6 and November 3, 2016 revealed 236 orders, 125 (53 percent) were prescribed per protocol with patients' home doses accounting for 25 percent of inappropriate prescribing. During this period, 207 melatonin doses were administered with 99 (48 percent) responses to sleep assessment queries which included better (8 percent) or same/worse (92 percent). These responses did not differ significantly when compared to responses from 2014-2015 for zolpidem (better [9.5 percent] or same/worse [90.5 percent], P equals 0.64) and zaleplon (better [10.7 percent] or same/worse [89.3 percent], P equals 0.49), respectively.

Conclusion: The addition of melatonin to the insomnia order set resulted in a further reduction in zolpidem prescribing but an overall increase in sleep medication prescribing. Compliance with using the order set was high and patient's home doses often accounted for inappropriately prescribed doses. Patients rarely reported sleeping better when melatonin was administered. This was consistent with earlier data following zolpidem and zaleplon dose administrations.

2017 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 35-T

Poster Title: Medication-use safety in the pediatric oncology setting: A survey of United States hospital pharmacy practices

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Purpose: Medication events involving high alert medications, including chemotherapy, are associated with a great level of patient harm when used in error. The pediatric oncology patient population is particularly vulnerable to the adverse consequences of medication misuse. The purpose of this survey is to examine the current state of pediatric oncologic healthcare in terms of the safeguards, policies, and quality improvement methodologies that institutions have in place to ensure safe medication management for pediatric patients. To our knowledge, no national survey has been published which assesses the current medication management practices of healthcare organizations in the pediatric oncology setting.

Methods: This 44-question electronic survey focuses on areas affecting pediatric patient safety within the medication-use system including: health information technology; medication prescribing, preparation, dispensing, and administration; quality assessment; and patient education. The questionnaire contains one open-ended question that asks the participant to describe a successful medication safety project at his or her respective organization. A total of 163 healthcare organizations which treat pediatric cancer patients were identified via U.S. News & World Report: "Best Hospitals for Pediatric Cancer," Children's Oncology Group (COG) Membership List, and the American Society of Health-System Pharmacists (ASHP) Online Residency Directory. The survey was electronically distributed to pharmacists identified in the ASHP Online Residency Directory. Recipients of the survey include Pharmacy Directors, PGY-2 Oncology Residency Directors, PGY-2 Pediatric Residency Directors, and PGY-2 Medication-use Safety Residency Directors. Email recipients were encouraged to forward the survey link to another member of his or her institution if deemed qualified to respond to the survey. The survey tool was reviewed by fifteen physicians and pharmacy leaders, and was approved by the Memorial Sloan Kettering Cancer Center Pharmacy Quality Assurance Committee.

Results: Forty-nine pharmacists completed this survey, an overall response rate of thirty percent. Thirty-seven percent of the institutions included in analysis were nationally ranked by U.S. News among the top 50 "Best Hospitals for Pediatric Cancer." Results of this survey indicate that within each phase of the medication-use system, the majority of respondents report adherence to established best practices in the pediatric oncology setting and the utilization of a variety of safeguards to promote safe medication management. For example, one-hundred percent of respondents report using both Electronic Health Records, as well as smart infusion pumps with safety software for pediatric patients. Eighty-four percent of respondents report having in place a barcode medication administration system for all inpatient pediatric chemotherapy. All participants indicate that prior to chemotherapy administration to pediatric patients, his or her facility mandates independent nurse verification. Additionally, eighty-two percent of the respondents prepare vinCRIStine in mini-bags which is consistent with the Institute for Safe Medication Practices 2016-2017 Medication Safety Best Practices. Regarding the use of tools to aid in the accurate and safe verification of parenteral chemotherapy, only twenty-four percent of institutions have implemented a gravimetric-based software system, and forty-one percent utilize camera-based visual documentation hardware.

Conclusion: Medication errors occurring within United States healthcare organizations are responsible for considerable patient morbidity and mortality, especially within the pediatric oncology population. This national survey demonstrates that a significant number of U.S. healthcare institutions which manage pediatric cancer patients have successfully implemented various safeguards to prevent the occurrence of medication errors. However, there may be a need for improvement in the process of pediatric chemotherapy preparation and pharmacist verification. Healthcare organizations should routinely assess current practices, and continue to develop strategies for system improvement.

2017 Summer Meetings Poster Abstracts

Submission Category: Small and Rural Pharmacy

Session-Board Number: 36-T

Poster Title: The impact of downsizing on clinical pharmacy services in a small rural hospital

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Purpose: To describe the changes made to maintain clinical pharmacy services and to compare the number of pharmacy interventions pre and post downsizing.

Methods: Staffing level full time equivalents (FTEs) for pharmacists and technicians decreased from two to one. The automated dispensing cabinets (ADCs) were adjusted to handle the weekends. The medical staff was alerted during the Pharmacy and Therapeutics (P&T) Committee meeting that they would have to do the dosings for vancomycin, piperacillin/tazobactam, potassium chloride, enoxaparin, basal insulin, warfarin, phenytoin, and aminoglycosides on the weekends. Pharmacy developed a communication form that lists patients who are being monitored by the BMCA pharmacists. This form is provided to the hospitalist on Fridays. Nursing now prepares intravenous admixtures on the weekends. In-services were given on vial mate adaptors and mini-bag plus for nursing. Every attempt is made to buy commercially available premixed solutions. A contract was signed with a compounding service to prepare hyperalimentation fluids. Additional crash carts were ordered for the emergency department for weekend coverage. A BMCA pharmacist takes call when the pharmacy is closed, and they handle consults upon request. The BMCA pharmacist restocks outages in the ADCs on Sunday mornings. A comparison of the number of pharmacy interventions for the fourth quarter of 2015 (pre downsizing) was made with the fourth quarter of 2016 (post downsizing).

Results: The number of FTEs decreased by one FTE pharmacist and one FTE technician. The doctors now handle the dosings of vancomycin, piperacillin/tazobactam, enoxaparin, basal insulin, warfarin, phenytoin, and aminoglycosides on the weekends, with assistance from nursing. Initial doses are ordered with a request for BMCA pharmacists to perform kinetic dosing and monitoring when the pharmacy is open. The number of pharmacy interventions decreased from 598 in the pre downsizing period to 539 in the post downsizing period, a 9.8%

decrease. In both periods, most of the interventions were for warfarin, enoxaparin, basal insulin, vancomycin, and potassium chloride.

Conclusion: It was a major challenge to handle downsizing while still maintaining a good medication use system. The collaborative team effort of the Medical Staff, Administration, Nursing, and Pharmacy has been successful in doing this. This is evidenced in the small decrease in the number of interventions.