

ASHP 2015 Summer Meetings Professional Poster Abstracts

Board#-Day

1-M

Category: Administrative practice / Financial Management / Human Resources

Title: Summary of the Presidents Council of Advisors on Science and Technology (PCAST) report on combating antibiotic resistance and its implications for hospitals and healthcare providers

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Purpose: In recognition of the worldwide emergency of antibiotic resistance, in September of 2014, The President of the United States issued an executive order for combating antimicrobial resistance, trying to take control of a problem that those in the healthcare field have been aware of for decades. Subsequently, the Presidents Council of Advisors on Science and Technology (PCAST) released a report on combating antibiotic resistance in which it provides recommendations and strategies on promoting appropriate antimicrobial use. This project was designed for a panel of pharmacists to review the report and provide recommendations to healthcare providers and hospital administrators.

Methods: The PCAST report was assessed by a four-member panel composed of pharmacists. The panel included pharmacists with specialized medication safety, infectious disease and research training. Three of the four members had completed an accredited pharmacy residency. The panel evaluated this report individually and gathered to discuss their findings.

Results: The PCAST provides eight recommendations in which each recommendation provides practical and actionable steps with the intention to achieve better surveillance, stewardship of existing antibiotics and development of new antimicrobial agents. The panelists focused the assessment on the sixth recommendation and its impact since this particular recommendation addresses the needs of improving the stewardship of existing antibiotic use in human healthcare. In the sixth recommendation, the PCAST proposes that the Center of Medicare and Medicaid Service (CMS) require adoption of an AMS program as Condition of Participation (CoP) for the Medicare and Medicaid programs by 2017. The recommended CoP for antimicrobial stewardship was noted to align with the Center for Disease Control and Prevention (CDC) AMS Core Elements reference. With the state of California being the pioneer of having statutory mandate for AMS implementation and its success, the panel agreed that transforming this PCAST recommendation into a nation-wide CMS mandate is a certain eventuality. In addition to reviewing the report and its implications, the panel evaluated the current literature to identify

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resources that are available to hospitals and healthcare providers to improve their current antimicrobial stewardship (AMS) efforts and assist in the implementation of AMS programs.

Conclusion: While antibiotic resistance has been an emerging problem, there have been no legislative or national initiatives to combat this issue thus far. The Presidential Executive Order and the subsequent PCAST report have made a revolutionary step in combating antibiotic resistance. More information on CMS regulatory standards for the establishment of AMS has yet to come but awareness for AMS has now been raised as a result of the report. We urge hospital administration and healthcare providers to start assessing the AMS efforts in their institution and provide leadership support to promote the success of the program.

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2-M

Category: Administrative practice / Financial Management / Human Resources

Title: Cost/benefit analysis of ready-to-administer prefilled syringes

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Purpose: Numerous opportunities for intravenous (IV) medication misadventures exist. Ready-to-administer (RTA) prefilled syringes have the potential to solve some of these problems. With fewer steps required for preparation, RTA prefilled syringes limit opportunities for mistakes and interruptions. They are pre-labeled and bar-coded to help avoid look-alike, sound-alike errors, and errors with unlabelled/ mislabeled syringes at point of administration. Needle-free RTA prefilled syringes reduce the risk of needle-stick injuries. RTA prefilled syringes increase assurance of sterility, may reduce waste, and allow better management of controlled drugs. Despite these positive attributes, some institutions have been slow to reap the benefits of RTAs because of concerns over storage or budget issues. RTA prefilled syringes must fit into existing storage/cabinet systems and pharmacy budgets. The Brigham and Womens commitment to medication safety compelled us to conduct a cost/benefit analysis to assess the actual effects on storage and budget of implementing RTA prefilled syringes in our existing system.

Methods: An analysis of pharmacy and nursing storage systems was undertaken to determine available space for RTA prefilled syringes and what additional storage would be required to accommodate an adequate PAR supply. For frequently used drugs, cost comparisons were calculated for RTA prefilled syringes versus vial plus needle/syringe, and versus outsourced compounded syringes.

Results: The RTA prefilled syringes we evaluated (BD Simplist) require about 1.25 locations to replace vials with an equal number of prefilled syringes, and we were concerned about having adequate space. Surprisingly, the analysis found that 38% (N=16,383) of locations were unoccupied and could accommodate RTA prefilled syringes without any adjustments (other than change in location within the cabinet). For injectable morphine, we had 209 Injectable morphine storage bins in 92 cabinets (0.5% of locations, 69% of cabinets). The analysis identified not only adequate capacity for prefilled morphine syringes, but also significant opportunities to reduce inventory without impairing service levels, thus reducing opportunities for diversion. We also evaluated existing pharmacy bulk carousel capacity to meet current

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throughput needs for midazolam (MD), ondansetron (OND), metoclopramide (MTC), and diphenhydramine (DPH), if we converted to RTA prefilled syringes. With daily wholesaler delivery, existing capacity approximately matches average daily consumption of MD (within 1%), OND (within 10%) and MTC (within 1%), and exceeds average daily consumption of DPH (by 30%). Cabinet inventory provides more than adequate buffer capacity to absorb usage variation. Cost Comparisons Cost comparisons were calculated for RTA prefilled syringes versus vial/syringe/needle or versus outsourced compounded syringes. Costs were slightly lower or higher with RTA prefilled syringes (generally, plus or minus 10%) compared to vial/syringe/needle, while RTA prefilled syringes midazolam cost substantially less than an outsourced compounded formulation. In addition, the longer shelf-life for RTA prefilled syringes reduces waste due to typical 60-90 days expiration for compounded drugs or unused pre-drawn OR syringes. Further, the continuity of supply from the RTA manufacturers vertically integrated supply chain avoids premium pricing due to shortages.

Conclusion: The potential benefits of RTA prefilled syringes pre-labeled, easy-to-read tallman lettering, point-of-administration bar-coding, needle-free administration, and fewer steps for preparation may contribute to safer medication administration and reduce the burden on nurses. In our system, most locations can accommodate the RTA prefilled syringes without any adjustments other than a change in location within storage cabinets. Costs for the RTA prefilled syringes were slightly higher or lower (generally, plus or minus 10%) versus vial/needle/syringe, and were more favorable for some drugs. Considering the non-financial benefits of prefilled syringes, the ability to store them without costly renovations, and comparable pricing, our cost/benefit analysis weighed in favor of RTA prefilled syringes and several drugs in this format are being implemented at our hospital.

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3-M

Category: Administrative practice / Financial Management / Human Resources

Title: Multi-dose medication dispensing at discharge (MMDD)

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Purpose: For many patients, several multi-dose inhalers are often ordered for individuals with respiratory conditions as new or continuation from home medications. Upon discharge, inhalers are returned to the pharmacy to be discarded as pharmaceutical waste despite having multiple doses remaining, representing a significant financial loss to the patient and the health-system. In addition, discharged patients may have a lapse in their inhaler therapy due to access or affordability which may lead to readmission. The primary objective of this study was to redesign the current health-system processes to send inhalers home with patients in order to improve transitions of care, increase patient satisfaction and decrease readmissions while reducing costs.

Methods: A limited community permit was applied for and obtained by each participating acute care facility within the health-system. Respiratory inhaler orders were defaulted to allow dispensing at discharge using computerized physician order entry (CPOE) decision support tools. Multidisciplinary alignment was sought through various institutional specific channels along with a physician champion and key partnership with nursing educators, respiratory therapists, and information systems. Following implementation, system interdisciplinary education, legal requirements and licensure; Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction and readmission data were tracked using CATALYST software and compared prior to and after program implementation. Patient education conducted by pharmacists were followed in order to measure ownership of the initiative amongst multi-facility personnel. Pharmaceutical waste in the form of inhalers returned to pharmacy for disposal was also collected to quantify a cost reduction due to removal charges by volume.

Results: On December 16th, 2014 the MMDD initiative went live within our health-system. Pharmacist education rose from an average of 418 patient educational encounters per month to 1,053 individualized patient education encounters in January. The top 5 medications educated by pharmacists were all inhalers encompassing 437 unique encounters and 41.5% of all patient pharmacist medication education. Amongst the top 20 medications educated by pharmacists 12 of which were inhalers tied to this program making 64% of the total

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medications educated on in January. Patient satisfaction via HCAHPS collection rose from 54.8% to 66.7% in the communication about medications category. Compared to fiscal year 2014 data, COPD readmissions decreased from 24% to 21% post go live.

Conclusion: A successful cultural transformation was accomplished by aligning multidisciplinary practitioners around a single patient centered initiative resulting in improvement of patient transitions of care and patient satisfaction while decreasing costs associated with readmissions

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Category: Ambulatory Care

Title: Impact of the ambulatory care floating team (ACFT) on the pharmacies waiting time

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Purpose: Ambulatory care pharmacies were facing a continuous annual increase in the number of patients and prescriptions (up to 9 percent per year) which created a lot of pressure on the department of ambulatory care pharmacy due to increased workload. Therefore, increased patients waiting time and affect their satisfaction. The ambulatory care floating team (ACFT) was initiated to serve the maximum patients with ambulatory pharmaceutical care in a timely manner within 30 minutes without compromising the quality of care provided, measure the impact on patients satisfaction, and possible cost saving.

Methods: This team was launched in August 2013. The members were assigned by the team leader to different pharmacies based on patients waiting time in each area during the patients peak times and emergency unplanned situations. During the pilot phase, the team underwent intensive cross training and pharmacy staff feedback was taken into consideration. The data represents a comparison between the percentage of patients who were provided with ambulatory pharmaceutical care within 30 minutes; Six months before the implementation of the team (January to June 2013) and six months after (January to June 2014) representing similar workload. Data were extracted from the official hospital ticketing waiting system from all ambulatory care pharmacies. Percentage in reduction in patients waiting time was based on the total number of prescriptions per day and the number of patients served within 30 minutes prior to and after the implementation of the floating team. T test was used to calculate the p value. The hospital quality department studied factors affecting patients satisfaction by conducting a survey thus showed that the duration of patients waiting time influenced their satisfaction. The members of the floating team were utilized from available staff of different ambulatory areas. Since no additional staff was added, organizational cost saving was possible.

Results: The total number of prescriptions of patients served in all ambulatory pharmacies before and after initiating the team was 633,713 and 675,242 ($p=0.9910$) respectively indicating no significant change in work load. Significant increase in patients served within 30 minutes which was from 79.36 to 91.12 percent ($p = 0.0023$). Percentage of patients'

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Satisfaction in the first two quarters of 2013 and 2014 respectively were as follows 95, 98 and 95, 99 percent. By measuring the teams productivity, since the team members work at peak times most of the time, it was found that 7 pharmacists from the floating team verified number of prescriptions equivalent to 19 pharmacists of all ambulatory care staff. Based on the basic salary of a Saudi pharmacist (10,760 Saudi Riyal equals 2,869 United States dollars); this team resulted in saving the hospital approximately 2.5 million Saudi Riyal (around 670,000 United States dollars).

Conclusion: Designing the ambulatory care floating team resulted in significant improvement in the percentage of patients served within 30 minutes in the pharmacy. In-addition, the employment of this team had a positive impact on patients satisfaction in all ambulatory pharmacies. Moreover, their creation helped with the cost saving of the organization. Coverage by these members during emergency leaves in certain ambulatory pharmacies was done immediately and smoothly without affecting the provided ambulatory pharmaceutical care. Staff cooperation and team work is an effective approach in patient satisfaction.

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Category: Ambulatory Care

Title: Prolonged duration hyperglycemia following a shoulder intra-articular glucocorticoid injection in a patient with diabetes

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Purpose: The case of a diabetic patient with prolonged duration hyperglycemia following a shoulder intra-articular (IA) glucocorticoid injection is reported. Glucocorticoid-induced hyperglycemia is well known with systemically distributed formulations, especially in patients with pre-existing diabetes. Systemic glucose effects of locally delivered glucocorticoids is not as well studied however. A few studies with small sample sizes found no significant difference in blood glucose levels following a shoulder IA glucocorticoid injection for patients with and without diabetes. Two studies found significantly elevated postprandial blood glucose levels in diabetic patients who received three local injections of a glucocorticoid at three-day intervals up to seven days after the third injection.

Methods: A 58 year old woman with a history of uncontrolled type 2 diabetes, hypertension, hyperlipidemia, obesity, and frozen shoulder presented with substantially elevated blood glucose levels within hours of a shoulder IA injection of triamcinolone acetonide 80 milligrams. Her most recent hemoglobin A1c was 8.0 percent and she reported fasting blood glucose levels ranging 150 to 170 mg/dL prior to the injection. Her diabetes medication regimen consisted of insulin glargine 32 units at bedtime and glimepiride 4 milligrams with dinner.

Results: Within the first twenty four hours following the glucocorticoid injection, her blood glucose rose to the 500 mg/dL range. She was symptomatically hyperglycemic and experienced diaphoresis, dizziness, blurry vision, and headaches. Her diabetes regimen was adjusted for four weeks until she achieved blood glucose levels similar to those prior to the injection. At four weeks, her insulin regimen had more than doubled and was up to 79 units throughout the day with the potential of more insulin based on a sliding scale.

Conclusion: There is currently little data evaluating the effect of shoulder IA glucocorticoid injections on blood glucose levels initially and even less data looking at longer term effects. Based on this patient case, there may be reason to proceed with caution when administering shoulder IA glucocorticoid injections to patients with diabetes. More conservative glucocorticoid dosing and close follow up of diabetes control prior to and following injection may be warranted.

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Category: Ambulatory Care

Title: Pharmacists provide telemedicine in addition to clinic visits to improve diabetes management

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Purpose: The addition of pharmacist telephone encounters to pharmacy clinic visits may serve as an innovative method to improve patient care and better manage chronic disease states. Utilizing pharmacists in this role may allow for greater identification of medication associated issues that may be preventing patients from achieving diabetic goals than clinic visits alone. The purpose of this study is to evaluate the impact of the addition of standardized telemedicine to pharmacy clinic visits focused on diabetes management compared to pharmacy clinic visits per usual care.

Methods: This study includes a prospective intervention arm compared to a retrospective control arm. The control arm consisted of patients who had initial and follow-up face-to-face pharmacy clinic visits per usual care during January 1st, 2014 to January 1st, 2015. Usual care consisted of pharmacy clinic visits with the possibility of telephone calls if the practitioner determined phone follow-up was necessary. Patients were included if they had established care with a pharmacist within the past year, with an A1c greater than 9% at their initial visit, and had been seen by their primary care physician within the last 6 months. Patient charts were reviewed to assess the interventions which occurred during the first 3 months of care in pharmacy clinic visits. The intervention arm received standard pharmacy clinic visits plus bi-weekly telephone follow-up. Patients with a hemoglobin A1c in the last 6 months greater than 9% and primary care physician visit within the last 6 months were eligible. At the clinic visit, an in-depth assessment was provided of the patients current medication regimen. Additional activities at the clinic visit included review of patients blood glucose logs, review of patients lifestyle, and the provision of patient education and recommendations to the provider for optimizing the medication regimen. In the intervention arm, in addition to usual care, as described above, telephone follow-up occurred two weeks following each pharmacy clinic visit. During the telephone follow-up, a brief assessment of the patients blood glucose readings over the past week was conducted and education and recommendations were provided. Patients received closer telephone follow-up as deemed appropriate by the provider. Upon completion of the 3 months of follow-up, at the last pharmacy office visit, patients were asked to complete a satisfaction survey.

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Results: Results to be presented include: Change in hemoglobin A1c over 3 month period in the intervention group compared to the control group as well as patient adherence to office visits, number of pharmacist interventions, types of interventions made during visits, and patient satisfaction with program (survey).

Conclusion: At the time of this abstract, 15 patients were enrolled into the intervention group and we plan to retrospectively match the same number of patient in the control arm. We hypothesize that the use of telemedicine in addition to current care provided by pharmacists will assist in lowering hemoglobin A1c levels.

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Category: Ambulatory Care

Title: Outcomes of a pharmacist-driven transition of care clinic on 30-day hospital readmission

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Purpose: The avoidance of 30-day readmissions is a priority for hospitals across the nation and has become the interest of reducing costs from fines and penalties. Transition of care clinics are a possible route to identify high risk patients and avoid 30-day hospital readmissions. Pharmacists have the education, accessibility, and expertise to address many of the issues that may result in a patient being readmitted and therefore, places pharmacists in a key position to be involved in transition of care. A pharmacist-driven transition of care clinic with the goal to reduce 30-day hospital readmissions was designed to optimize medication use, improve medication safety, and help coordinate physician follow up. The purpose of this report is to describe the impact of the pharmacist-driven transition of care clinic on 30-day hospital readmission.

Methods: Adult patients recently discharged were screened for eligibility based on comorbidities, number of medications at discharge, geographic location, insurance, and number of hospitalizations in the last 12 months. Participants were followed by the transition of care clinic for 30-days from their discharge date and seen for a minimum of one visit. A retrospective chart review was performed for all patients seen in the pharmacist-led transition of care clinic from August 2014 through February 2015. Rates of hospital readmission and/or emergency department visits during the 30-days post-discharge were assessed by reviewing the patients electronic medical records, which included information from seven campuses in a large healthcare system, and by calling patients to assess if they had been hospitalized at a facility outside of the healthcare system. If patients were unavailable for contact via phone, it was assumed that the patient was not readmitted based on the healthcare systems electronic medical records.

Results: Twenty patients were seen in the transition of care clinic from August 2014 to February 2015. Of these patients, 85% were followed for at least one visit in the transition of care clinic and did not have a 30-day hospital readmission. In patients with a 30-day hospital readmission, the average number of days post-discharge was four days (ranging from two to seven days). Five percent of patients evaluated were found to have an emergency department visit. The average number of days after hospital discharge that a patient was seen in the emergency department was 9 days.

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Conclusion: Readmission to hospitals within 30 days of discharge is a problem that has received attention in light of recent changes in pay-for-performance models. Programs that focus on managing the transitional period of time from hospital discharge until patients are seen by their primary care providers offer an important service in reducing costs and improving outcomes. Enrollment in a pharmacist-driven transition of care clinic has positively impacted the avoidance of 30-day hospital readmissions and emergency department visits due to medication-related problems and lack of follow up care.

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Category: Ambulatory Care

Title: Clinical pharmacist involvement in the management of patients in a heart failure clinic: a quality improvement initiative

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Purpose: Heart failure (HF) affects over 5.1 million individuals in the United States with a national, unplanned 30-day readmission rate of 22.7 percent. We assessed the feasibility and benefits of pharmacy services in a private physician group HF clinic, in an effort to improve transitions of care, promote patient compliance and ultimately reduce re-hospitalizations.

Methods: Pharmacy residents provided services three half-days a week in a private physician group HF clinic and were available to all patients with priority given to patients discharged from the hospital within the past 90 days. Residents identified patient medication discrepancies, provided medication education, reviewed diagnostic tests and laboratory values, recommended appropriate immunizations, identified and assessed financial and other barriers to medication adherence, and collaborated with physicians to optimize medication therapy. All discrepancies and interventions were documented using an adapted medication-discrepancy tool reported by Coleman et.al. Rates for HF readmission were also collected for analysis.

Results: After 27 clinic days, there were 174 patient encounters with 70 (40.2 percent) of patients being recent hospital discharges. Residents spent 25 minutes per patient with the majority of contact time during what was traditionally down-time for the patient during the clinic visit. Feedback from clinic staff noted no delays, but rather improved patient progression. Discrepancies in medication lists were identified in 111 (63.7 percent) patient encounters while adverse drug reactions were noted in 14.9 percent of encounters. There were 47 (27.0 percent) encounters with performance or knowledge deficits, and non-adherence was identified in 17.2 percent of patients. Residents recorded 2.7 medication interventions per patient encounter including 152 medication list discrepancy resolutions and 67 recommendations to physicians resulting in therapy modification or monitoring changes. Of fifty-seven patients followed-up for 30 days after hospital discharge, 7 patients were re-admitted within 30 days, yielding a heart failure 30-day readmission rate of 12.2 percent.

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Conclusion: Inclusion of pharmacy residents in a private physician group HF clinic promoted medication optimization, facilitated detection of medication discrepancies, increased patient contact time without compromising established workflows, and promoted multidisciplinary care.

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Category: Ambulatory Care

Title: Implementation of a Pharmacist Driven Transitions-of-Care Team

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Purpose: Drug therapy problems are prevalent during transitions-of-care. It is estimated that 25% of hospital admissions are due to medication non-adherence and as many as 19% of admissions are due to adverse drug reactions. Forster et al. (2003) revealed nearly 20% of patients experienced adverse events as they transitioned from hospital to home; of those events, over 70% can be attributed to medications. It is estimated that more than half of post-discharge adverse drug events are preventable with the implementation of activities such as discharge counseling, medication reconciliation and post-discharge follow-up and monitoring. Pharmacists are well suited to optimize drug therapy, identify barriers to non-adherence, provide education, and guide patients in medication self-management. Studies have shown that pharmacist interventions can decrease medication errors, hospital readmissions, and length of stay while improving treatment compliance, patient satisfaction, and quality of life in a cost effective manner. A pharmacist driven transitions-of-care team was developed with the objective of identifying and solving drug therapy problems of patients admitted to Legacy Mount Hood Medical Center.

Methods: In order to expand pharmacist services, direct patient care was given priority in our daily workflow. Emergency department pharmacists assessed medication compliance and related adherence issues while completing medication reconciliation. Centralized order verification allowed more time for decentralized pharmacists to focus on educating patients about their disease state and medication-related problems midway through their stay. Outpatient pharmacy services were expanded to include hospital discharge prescriptions with pharmacy interns delivering and providing medication counseling. An ambulatory care pharmacist was added to our staffing to follow-up on unresolved drug therapy problems that were identified inpatient and to provide medication therapy management. Pharmacists were trained in appropriate communication methods through two motivational interviewing seminars and a teach-back method workshop. Patient friendly handouts on core disease states were developed maximizing graphics and targeting elementary school reading level. In order to improve patient medication compliance, individualized patient medication charts were created

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in different formats to clearly demonstrate all prescribed medications and the appropriate administration time. In addition the pharmacists were able to provide patients with other compliance tools, such as pill organizers and medication wallet cards at no cost. All patients admitted to the medical or surgical units were considered for the transitions-of-care pharmacy services with the exception of patients who received professional assistance with outpatient medication administration.

Results: Emergency department pharmacists provided medication reconciliation and assess medication compliance during peak times ten hours per day, seven days per week. By rearranging our staffing workflow, two decentralized pharmacists and one pharmacy intern were able to see an average of six patients per day during the weekdays. On weekends, one decentralized pharmacist was available to see an average of three patients per day. Pharmacists time with patients varied, but was typically between 15 and 30 minutes. The outpatient pharmacy, open weekdays, filled an average of 30 discharge prescriptions per day. Pharmacists, nurses, and physicians referred an average of seven patients per week to the ambulatory care pharmacist for follow-up and/or medication therapy management. This new service promotes the profession of pharmacy and pharmacists as health care providers. It has positively impacted our patients as demonstrated by several anecdotal case reports which fall into the following categories: identification of adverse drug events leading to hospital admission, improved affordability of medications, improved efficacy and safety of medication therapy, increased medication compliance, prevention of adverse drug events after hospital discharge, and improved patient satisfaction.

Conclusion: By redefining our pharmacy practice model with pharmacists providing direct patient care, we have shown a positive impacted during transitions-of-care.

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10-M

Category: Automation / Informatics

Title: Cart fill expansion: preventing unnecessary pharmacy products and product scanning alerts in patient care areas

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Purpose: Traditional once-daily medication cart fill delivery can result in unnecessary pharmacy products in patient care areas due to medication orders that change throughout the day. Increasing the number of cart fill deliveries can decrease the number of unnecessary, unreconciled product dispensed to and remaining in patient care areas. The purpose of this analysis is to evaluate unreconciled dispenses before and after implementation of a multiple-times-daily cart fill schedule, as well as the impact on bedside barcode scanning safety metrics.

Methods: This retrospective, single-center intervention analysis examined cart fill and return/unreconciled dispense data in inpatient pharmacy (IP) and sterile product area (SPA) settings before and after implementation of an expanded multiple-times daily cart fill schedule. Dispensing and returns/administrations were examined for September 2013 (cart fills: once-daily IP and thrice-daily SPA) and July 2014 (cart fills: six-times-daily IP and seven-times-daily SPA), as well as barcode medication administration (BCMA) data for September 2012 through September 2014. The primary outcome measure was the change in return/unreconciled dispenses from both IP and SPA settings, with a secondary outcome measure of the change in BCMA product alerts associated with scanning of incorrect or off-schedule medications.

Results: An overall 6.5% reduction of returns/unreconciled dispenses occurred after implementation, as well as an annualized 13% reduction of BCMA product alerts. The reductions for both outcome measures remained stable after implementation of an expanded multiple-times daily cart fill schedule.

Conclusion: Implementation of a multiple-times daily cart fill schedule in both inpatient pharmacy and sterile product area settings may be associated with a reduction of unnecessary pharmacy products in patient care areas, and also lead to a reduction of BCMA product alerts. Some portion of the results could be attributed to factors not related to the intervention of this

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study. However, the reductions may begin and remain sustained from the initial time of the intervention.

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11-M

Category: Automation / Informatics

Title: Electronic clinical surveillance phased deployment to drive an antimicrobial stewardship program

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Purpose: Electronic clinical surveillance software is becoming increasingly common among antimicrobial stewardship programs (ASPs). The technology often takes antiquated manual processes and transforms them into more efficient clinical practice. The use of such technology can be tailored to very simple or very advanced antimicrobial stewardship activities. Often times this software is deployed across the entire pharmacy department, where part of the challenge is the knowledge gap between the simple to advanced antimicrobial stewardship activities. A community hospital in North Texas deployed the use of a clinical surveillance system to achieve success with their ASP. A well thought out phased approach to deployment of antimicrobial stewardship alerts, led to increased staff comfort level and increased pharmacist activities related to antimicrobial stewardship.

Methods: The antimicrobial stewardship committee first conducted a gap analysis of the ASP. The analysis compared the current ASP to what a best practice ASP should resemble. This allowed the pharmacy department to identify areas for policy development to assist with antimicrobial stewardship activities. Next, the pharmacy department provided an internal survey to all of the pharmacy staff. This was administered to assess any knowledge gaps related to antimicrobial stewardship activities. The following clinical topics were covered on the survey: iv to po route optimization, dose optimization (renal and extended infusion), hospital specific restricted antimicrobials, multi-drug resistance pathogens, drugs of choice for targeted bacteria, and de-escalation. The results of the survey were analyzed to determine educational opportunities among the staff. Education opportunities were then placed into several categories including: re-education on hospital policy, in-service needed, or online didactic course required. Finally, clinical surveillance alerts (or rules) were developed that were customized to clinical areas of focus agreed upon by the ASP. Using the program gap analysis as well as the staff educational gap analysis as a guide, the alerts were then put into a deployment schedule. The schedule was ordered based on simple to more advanced antimicrobial stewardship activity.

Results: The program as well as the educational gap analysis found that de-escalation was an area where the ASP had opportunities for improvement. The ASP was able to quickly install custom alerts that at least targeted the low hanging fruit de-escalation opportunities while they worked with staff on further education. An example, of low hanging fruit de-escalation was utilizing an alert that targeted patients with a methicillin sensitive Staph. aureus infection that

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were currently being treated with vancomycin. As in-services and educational opportunities were conducted with the pharmacy staff, more ASP related alerts were deployed using the software. From 2011 to 2014, the number of pharmacist activities related to antimicrobial stewardship increased from just 200 to more than 1000. This can be attributed to taking the time to educate staff where gaps have been identified, and complementing the gap with a custom alert.

Conclusion: The flexibility to deploy custom clinical surveillance alerts contributed to more than a few reasons for the success of the ASP. Taking the time to complete the program and educational gap analysis allowed the ASP to prioritize which activity to embark upon first. The electronic clinical surveillance helped drive an efficient process for a phased approach to the alerts.

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12-M

Category: Automation / Informatics

Title: Impact of utilizing and optimizing clinical decision support on admission medication reconciliation process

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Purpose: Performing accurate medication reconciliation during admission is vital for providing quality patient care. Inaccurate medication reconciliation often leads to medication errors, such as duplicate or omitted medications. At the University of Virginia Health System, one of the hospital-wide patient safety initiatives is streamlining the medication reconciliation process. Observation of various licensed independent practitioners performing admission reconciliation identified several areas for improvement. One of them was the non-formulary medication alert without guidance (MA), which interrupted workflow and caused alert fatigue. The primary objective of this project was to evaluate the impact of utilizing and optimizing clinical decision support on the admission medication reconciliation process.

Methods: By analyzing data from the Epic electronic medical record (EMR), the MA and triggering non-formulary medications were identified. Between December 2014 and February 2015, medication alerts with guidance (MAWG) were created and attached to the identified medications. The following data were collected from the EMR: number of MA firings, and the MA/MAWG user response rate. Pre-implementation data from November 2014 was compared against post-implementation data from February 2015.

Results: During November 2014, the MA fired 2282 times, which was approximately 76 times per day. The fired alerts were cancelled by users 1841 times (81%). Examples of common triggering medications included non-formulary strengths or formulations of losartan and aspirin tablets. Between December 2014 and February 2015, 31 MAWGs were created. Since December 2014, a steady reduction in the number of alert firings was observed. During February 2015, the MA fired 1831 times, which was approximately 65 times per day. In addition, the MAWGs fired 936 times. The MAWGs were accepted 650 times (69%), cancelled 280 times (30%), and continued for 6 times (1%).

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Conclusion: After creating the MAWGs, the number of MA firings was reduced. In addition, most of the alternatives suggested by the MAWGs were accepted by the users. Further analysis is needed to evaluate the impact on medication reconciliation accuracy.

ASHP 2015 Summer Meetings Professional Poster Abstract

Board#-Day
13-M

Category: Cardiology / Anticoagulation

Title: Evaluation of treatment failures and in-hospital major bleeding with an extended bivalirudin infusion during percutaneous coronary interventions

Primary Author: Mark Bishard; **Email:** mark.bishard@sclhs.net

Additional Author (s):

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Purpose: Results of the REPLACE -2 trial revealed that bivalirudin with provisional GPIIb/IIIa blockade is non-inferior to heparin plus planned GPIIb/IIIa blockade during percutaneous coronary interventions for ischemic end points and is associated with less bleeding. However, a recent meta-analysis published in Lancet concluded that compared to a heparin-based regimen, a bivalirudin-based regimen increases risk of myocardial infarction and stent thrombosis yet decreases the risk of bleeding. Based on conflicting results of the two papers, an evaluation was undertaken at Lutheran Medical Center (Sept 1-2014 to Dec 31-2014) evaluating treatment failures and evidence of major bleeds with an extended bivalirudin dosing regimen (0.75-mg/kg bolus plus 1.75 mg/kg per hour) which consisted of infusing the prepared bag until complete which could extend past percutaneous coronary intervention procedure.

Methods: Based on conflicting results of the two papers, an evaluation was undertaken at Lutheran Medical Center (Sept 1-2014 to Dec 31-2014) evaluating treatment failures and evidence of major bleeds with an extended bivalirudin dosing regimen (0.75-mg/kg bolus plus 1.75 mg/kg per hour) which consisted of infusing the prepared bag until complete which could extend past percutaneous coronary intervention procedure. This varies from previous studies where the bivalirudin infusion was stopped at completion of the percutaneous coronary intervention procedure. Patients were also given various combinations of dual antiplatelet therapy. Treatment failure was categorized as the need for further interventions within 30 days and/or readmission for cardiac events.

Results: Fifty patients were identified in the bivalirudin group. Patients were predominantly male, with an average age of 67.5 years. Majority of the patients presented with either a Non-ST-segment myocardial infarction (40%) or positive stress test requiring diagnostic catheterization and intervention (40%). One patient in the bivalirudin group received a GPIIb/IIIa inhibitor. Four patients were readmitted within 30 days with signs and symptoms of acute coronary syndrome, but sequela from acute coronary syndrome was ruled out. One death was observed within 30 days but was attributed to a comorbidity of advanced chronic obstructive pulmonary disease. No patients were treated for a major bleed.

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Conclusion: The continued infusion of bivalirudin, even past PCI procedure time did not appear to result in treatment failures or contribute to the adverse drug reaction of bleeding. The practice may have allowed dual antiplatelet therapy to become more fully absorbed, thereby preventing early thrombosis of stents.

ASHP 2015 Summer Meetings Professional Poster Abstract

Board#-Day
14-M

Category: Cardiology / Anticoagulation

Title: Feasibility of CYP2C19 genotype testing for patients at risk for acute coronary syndrome

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Purpose: Researchers and clinicians have theorized that implementation of pharmacogenomic testing will lead to precision medicine, where specific drugs can be targeted for individual patients based on their unique genomic profile. Despite emergence of robust data for specific CYP2C19 genotypes-phenotypes associations (i.e., full, partial, or non-response to clopidogrel), successful clinical implementation of CYP2C19 genotyping is elusive (Bouman 2011, Collet 2011, Mega 2011, Pare 2010, Harmsze 2010, Hochholzer 2010, Geisler 2008, Gladding 2008). Notable barriers to clinical implementation include cost of testing, knowledge deficits among front-line clinicians, as well as ethical and regulatory concerns. Previous studies that have looked at implementing such a service have been limited to inpatient acute care settings (Roberts 2012) or within a community pharmacy (OConnor 2012). Therefore, the purpose of this study is to begin to develop an understanding of the feasibility of implementing a novel clinical pharmacy service for providing CYP2C19 genotype-guided antiplatelet therapy recommendations in two ambulatory cardiology clinics within an integrated health care delivery system.

Methods: The institutional review board and ethics committee approved this prospective, open-label, single arm, feasibility study in eligible patients who were; 18 to 75 years of age, Kaiser Permanente Colorado patients followed at Rock Creek or Franklin Cardiology, not receiving antiplatelet therapy beyond aspirin within two weeks preceding enrollment, and referred for elective coronary angiography and potential percutaneous coronary intervention (PCI). Subject identification was conducted during a consultation visit with a KPCO cardiologist when cardiac catheterization was recommended. A cheek swab sample for CYP2C19 genotyping was obtained from patients who provided informed consent. Genelex (Seattle, WA), analyzed the sample and provided the genotyping results to a KPCO clinical pharmacy specialist who developed a precise anti-platelet therapy recommendation based on the most recent guidelines published from the Clinical Pharmacogenetic Implementation Consortium [CPIC] (Scott 2013). Recommendations were provided to the attending cardiologist as well as the patient. The following outcomes were assessed: availability of genotype results prior to elective cardiac catheterization, and prescriber and patient acceptance.

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Results: Of the patients screened between August 2013 and December 2014, 22 patients were identified as being eligible for participation in this study. Of the 22 eligible, six patients provided informed consent. All six patients received genotype results prior to cardiac catheterization and all subsequent recommendations were accepted by both the cardiologists and patient. Two of the six patients were CYP2C19 intermediate metabolizers, while four patients were extensive metabolizers.

Conclusion: Genotype results were available prior to each of the elective cardiac catheterization procedures. In addition, recommendations made by KPCO clinical pharmacy specialists were accepted in all six cases by both physician and patient. However, despite these positive outcomes significant barriers were identified including electronic medical record capabilities and processes in handling sensitive genetic information. Therefore, our results suggest that an add-on, reactive CYP2C19 genotype approach for precision antiplatelet therapy was not feasible to implement in an ambulatory cardiology clinic without alternations in underlying clinic infrastructure and workflow. Given the success of pharmacogenomic programs that incorporate a preemptive approach to CYP2C19 genotyping (Roberts 2012), a similar approach may serve as the more feasible method in developing a CYP2C19 genotyping service within an integrated health care delivery system.

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Board#-Day
15-M

Category: Clinical Service Management

Title: Pharmacy technician support role in a primary care resource center.

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Additional Author (s):

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Purpose: In the Primary Care Resource Center (PCRC) Project, hospital-based care coordination hubs were created in 6 community hospitals specifically charged with lowering readmission rates for chronic obstructive pulmonary disease, heart failure, and coronary artery disease. One full-time care transition pharmacist (CTP) was recruited at each PCRC site to provide medication management services for patients with the target diseases. It is the goal for the pharmacist to engage all patients during their inpatient stay, providing medication education and review, addressing adherence issues and reconciling medications; and after discharge, by phone follow-up within 72 hours. All patients must also receive a comprehensive medication review prior to discharge or within 5 days of discharge (by phone or follow-up visit). Pharmacists at each of the sites had the latitude to customize workflow and processes as long as core elements of the framework were achieved. At one site, with over 400 beds, the largest in the PCRC group, the patient volume challenged the capacity of the single pharmacist to provide all expected elements of care to the full cohort of eligible patients. A new pharmacy technician role was considered a cost-effective option to extend the pharmacists reach.

Methods: Pharmacist work was reviewed and technical functions identified that could be assigned to a specially trained pharmacy technician. A certified pharmacy technician was recruited to perform clinical support functions under the direction of the CTP, eight months after opening of the PCRC, and once work processes had stabilized. The pharmacy technician was provided training in the hospital electronic health record (EHR) and medication reconciliation module; physician practice EHR and medication record documentation; locating pertinent laboratory and diagnostic tests; and medications common to the target disease states. Daily activities of the pharmacy technician include preparation and maintenance of the active patient roster and pending discharges, assembling patient medication education cards, retrieving laboratory and diagnostic test information relevant to the target diseases, and noting discrepancies between disparate systems medication records. In addition, the technician helps to update medication databases so that pharmacist clarifications are reflected across the nursing medication record, discharge instructions, and primary care physician practice, and are readied for pharmacist verification. The pharmacy technician also provides administrative

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support, including managing submission of patient medication assistance forms and coordinating hospital-to-home program vouchers, transmitting the pharmacist care note to the primary care physicians, and assisting with data collection and documentation.

Results: Comparing three months prior to the addition of the pharmacy technician to the three months following implementation (allowing for an orientation period), patient admissions increased from 350 to 413, an increase of 18%. Pharmacist inpatient encounters remained steady (-2.8%), but admissions receiving a comprehensive medication review was increased by 19.8%. The pharmacist now has time to make follow-up, post-discharge phone calls to patients with medication-related concerns. Subjectively, the addition of the pharmacy technician is an invaluable addition that allows the pharmacist to spend more time with patients, and allows for more timely issue resolution.

Conclusion: Addition of a pharmacy technician to augment pharmacist care into a primary care resource center team provides a resource to extend the reach of the pharmacist, and allows more time for the pharmacist to work at the top of their license. New and expanded clinical support roles for pharmacy technicians should be explored.

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Professional Poster Abstract

Board#-Day
16-M

Category: Clinical Service Management

Title: Development of medication assessment guidelines to standardize patient assessments for care transition pharmacists across multiple settings.

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Purpose: Pharmacists are becoming integral members of care transition teams; the presence of a full-time pharmacist, in both the inpatient and outpatient setting, are invaluable in educating patients, reducing adverse drug reactions, and enhancing medication adherence. In Pittsburgh Regional Health Initiatives Primary Care Resource Center (PCRC) Project, hospital-based care coordination hubs were created in 6 community health systems were specifically charged with lowering readmission rates for COPD, heart failure, and acute myocardial infarction. Each PCRC team was comprised of 1 pharmacist, 3-4 nurse care managers, and an administrative assistant. Teams engaged patients at the point of admission, and applied a prescribed care management protocol through discharge, potentially extending to one or more home visits, and communicated finding and recommendations with the primary care physician. Pharmacists were given two critical tasks to be performed on each enrolled patient: (1) comprehensive medication management, either during the admission (at bedside) or within 5 days of discharge (by telephone or at a PCRC office visit); and (2) telephone contact with the patient within 72 hours of discharge. Pharmacists were encouraged to innovate and develop process supported by local culture and resources, and as a result, developed diverse practice models and care processes.

Methods: A quality improvement team comprised of pharmacists from the 6 PCRCs and a facilitator was established. After an initial site assessment, a series of virtual meetings were held, and recommendations for process improvements were made. Pharmacists then prioritized recommendations based on impact on outcomes (e.g. decreasing admissions and readmissions for target diseases) and relative ease of implementation. Two of the top-ten recommendations were to develop standard assessment guidelines for target disease assessment and guidelines for monitoring high-risk medications. High risk medications common to the three target diseases were identified, and including high-hazard medications and medications considered important to chronic management of the target diseases. In addition, due to its frequency as a recognized comorbidity in the target populations, the group also developed assessment guidelines for diabetes. Once the common high risk medications were identified, assessment guidelines were developed based on group discussion and review of the literature.

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Results: Four assessment quadrants were developed for each target disease: diagnostic tests (to guide therapy or monitor disease response or progression), laboratory tests (to drive therapy optimization), high risk medications, and patient engagement (patients knowledge of their disease and medications to ensure a high level of self-management after discharge). Based on the guidelines, a high-risk medications checklist that includes a list of pertinent laboratory and diagnostic tests for each high-risk medication, patient engagement strategies and the rationale for the monitoring parameters was developed as a quick reference. In addition, a cross-walk of all diagnostic tests and monitoring parameters was created in order to help to define laboratory and diagnostic tests common across disease states to streamline data abstracting processes, and begin to support creation of electronic dashboards. Pharmacists participated in case studies with peer discussion to strengthen their understanding of the assessment guidelines and how they are applied.

Conclusion: A multi-site pharmacist quality improvement team developed assessment guidelines to support comprehensive medication review process standardization for four target diseases. Creation of common assessment guidelines across 6 practice sites has set the foundation for standardized processes of care in disparate settings and a common platform for team discussion, quality improvement, and creation of electronic health record decision support tools.

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Board#-Day
17-M

Category: Drug Information

Title: Assessment of understanding and development of patient-centered prescription label instructions for patients with limited literacy, vision impairment and the elderly

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Purpose: The elderly, limited literacy or those with vision impairment often have poor cognitive flexibility and need to work harder to process the directions written on the prescription label. To improve patient comprehension, the dosage instructions at our medical center are enlarged with traditional Chinese letters of 14 points and contain 1.4cm*1.4cm pictorial icons. However despite these efforts to improve the prescription label, many patients still have difficulty understanding the dosage instructions. The aim of this study is to evaluate the current dosage instructions, collate information on patient preferences and develop the patient centered optimum format.

Methods: Patients who are at high risk of misunderstanding prescription label (the elderly, limited literacy or those with vision impairment), have multiple medications with at least three or more different frequency of use and actively seeking help were eligible to participate in this study. The elderly is defined as those 65 years or older. Vision impairment is defined as those with eye-sight disorders or those with difficulty reading dosage instructions when the label is placed on the table and the patient is standing up. Institutional review board at this medical center approved this study. Patients understanding of dosage instructions of the current prescription label was assessed through a structured interview. Patient responses to dosage instructions were rated as either correct or incorrect by an independent pharmacist. If patients cannot correctly interpret the current prescription label and pictorial icons, pharmacist discussed with patients on their individual preference for the content of the prescription label. Patients interpretation of the new modified prescription label instructions were then evaluated by another independent pharmacist. If the label modifications allowed patients to understand how to take their medications, these modifications were written on the blank space of the prescription label.

Results: 74 patients were recruited in the study period, and 68 patients completing the study. More than half patients (67.6%) cannot interpret the current prescription label instructions. Elderly patients have no particular preference for the format of their prescription label

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($p=0.269$). Patient with vision impairment preferred dosage instructions to be written in larger font, filling the blank space : approximately 36 points($r=+0.677$ $A_p=0.0001$). Patients with poor literacy preferred instructions to be written in a simple and clear format using Arabic numerals. For example, if the medication was needed to be taken one tablet once a day, pharmacist would write 1 on the prescription label and if one tablet were needed twice a day, write 2 on the label. If the medication was needed to be taken more than one tablets at the same time, such as take two tablets twice a day, then it would be written 2 on the left hand side of the label indicating morning and another 2 on the right hand side of label indicating night. After modifications were made based on patients individual preference, all patients (100%) understood the dosage instructions. Even though there are other methods to improve medication safety such as the use of dosette boxes and medication lists, this method is more cost-effective and can be individualized to patients needs.

Conclusion: This study does not support the use of pictorial icons. Efforts to improve label format should be patient centered and include the use of larger font and numeric presentation. Additional study is required to assess whether these modifications will affect long term medication-taking behavior and improve health outcome.

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Professional Poster Abstract

Board#-Day
18-M

Category: Drug Information

Title: A student-pharmacist driven initiative to impact cervical cancer rates in rural Arkansas: assessing the educational needs of an undergraduate population.

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Purpose: Despite the availability of human papillomavirus (HPV) vaccines, the incidence of cervical cancer in medically underserved, rural Arkansas remains strikingly higher than the national incidence. Due to this increased incidence, a group of research students at Harding University College of Pharmacy conducted a program to educate and increase awareness of HPV and HPV-related disease to undergraduate students. The goal of the educational program is to raise awareness of HPV-related disease which will positively impact HPV vaccination rates leading to a decrease in cervical cancer and other HPV-related diseases.

Methods: Population surveys were conducted to better understand current knowledge and perceptions of HPV-related infections and vaccines. Student pharmacists, under faculty supervision, designed a survey to identify the general knowledge base and perceptions about HPV-related disease and vaccination. The survey consisted of sixteen questions regarding demographics, HPV facts and related diseases, vaccination awareness, and willingness to receive the vaccine. Surveys were administered to undergraduate students in Arkansas. A tailored educational program was prepared based on survey results.

Results: The majority (75%) of survey participants had heard of HPV; leaving 25% who had never heard of the virus. When presented with a list of disease states and cancers, few were able to correctly identify those that were linked to HPV. Roughly 20% had received an HPV vaccine. The survey didnt distinguish between number of vaccine doses received. Forty-five percent were interested in receiving the HPV vaccine. The ten minute educational program has been presented six times to undergraduate social and civic organizations with more presentations scheduled. Three hundred and fifty students have been educated.

Conclusion: Undergraduate students know little about HPV-related disease although most have heard of the virus. This population will benefit from a brief educational presentation that presents facts and dispels myths about HPV. It can be inferred from the results that providing

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education will positively impact HPV vaccination rates, thus lowering the rate of cervical cancer and HPV-related disease.

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Professional Poster Abstract

Board#-Day
19-M

Category: Drug-Use Evaluation

Title: Adverse drug reaction monitoring of Tramadol in Seoul St. Marys Hospital, South Korea

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Purpose: Adverse drug reaction (ADR) monitoring is a process for collecting and evaluating information about side effects for the purpose of protecting patients from the unwanted harmful effects of a drug. In South Korea, fifteen Regional Pharmacovigilance Centers were established in 2009 and voluntary ADR reporting has exponentially grown since then. The Catholic University of Korea, Seoul St. Marys Hospital has been designated as a Local Pharmacovigilance Center, where spontaneous ADR reporting is in practice, contributing to promotion of ADR monitoring activity in South Korea. In this study, we analyzed and overviewed the most commonly reported ADR status of Tramadol in recent years.

Methods: We conducted surveys about the ADRs of tramadol reported through computerized system and whose relationship with the drug was assessed as at least possible based on the WHO-UMC causality assessment criteria. We also retrospectively investigated patient information and evaluated ADRs in terms of causality, severity, progress and type

Results: Out of 2,548 cases spontaneously reported from March to August in 2014, 267 ADRs were found to be causally related to Tramadol. The average age of patients was 5930 years, and the ratio of men to women was 1:1.82. The serious ADRs included seizure (1 case) and hypotension (3 cases), all of which were resolved. The most frequently reported symptoms were gastrointestinal disorder (70.4%) and central & peripheral nerve disorder (15.7%). Symptoms of nausea (46.4%), vomiting (23.6%), dizziness (10.1%) and diaphoresis (7.9%) were frequently reported. There were also reports of respiratory distress, chest pain, paraesthesia, and headache. All reported symptoms were included in Tramadols insert paper of KFDA (Korean Food and Drugs Administration)

Conclusion: In conclusion, ADRs related to Tramadol were more prevalent in women than men, and the most frequently reported ADRs were nausea, vomiting, dizziness and diaphoresis. Symptoms of serious ADRs included convulsion and hypotension, all of which were resolved. The data of this study will contribute toward accumulating safety information about Tramadol through long-term monitoring.

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Board#-Day
20-M

Category: Drug-Use Evaluation

Title: Commonly used adjunctive therapies for patients with partial-onset seizures

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Purpose: Some subjects with partial onset seizures can be managed using monotherapy. Patients with epilepsy who fail antiepileptic drug (AED) monotherapy may experience more severe symptoms and progress to adjunctive therapy. The present study sought to better understand the utilization and cost of adjunctive AEDs in patients with partialonset seizures in a real world setting.

Methods: This was a retrospective database study using the Human Capital Management Systems (HCMS) database of commercially insured subjects. Married US employees whose spouses had partial onset seizures (ICD9CM=345.4x, 345.5x) between January 1, 2001 and June 30, 2014 were identified. Subjects with partial onset seizures with >90 days concomitant use of a second AED were classified as adjunctive therapy users; monotherapy subjects were those without >90 days concomitant use of a second AED. Subjects were required to have at least 365 days of continuous eligibility following initial AED use. Adjunctive AED utilization, days supply, and average cohort and per-user costs were calculated for the follow-up period.

Results: Three hundred and sixty-seven employeespouse pairs were identified. One hundred and twenty-nine spouses with partial onset seizures (34.9%) received adjunctive therapy and 238 spouses with partial onset seizures (65.1%) received monotherapy. At index, mean age of patients with partial onset seizures was 43.4 years. The average time to treatment from first partial onset seizure diagnosis was 17.8 days for those initiating monotherapy and 56.6 days for those initiating adjunctive therapy. Subjects progressing from monotherapy to adjunctive therapy did so after an average of 41.4 days. The most commonly used adjunctive therapy AEDs were levetiracetam (52.7%), topiramate (38%), lamotrigine (31.0%), carbamazepine (28.7%), gabapentin (20.9%), phenytoin (19.4%), clonazepam (18.6%), and oxcarbazepine (14%). Days supply of medicine (standard error) were 307.6 (46.4) days for phenytoin, 289.7 (26.1) days for carbamazepine, 282.3 (24.8) days for lamotrigine, 278.9 (17.3) days for levetiracetam, 267.1 (30.3) days for gabapentin, 254.9 (25.0) days for topiramate, 192.8 (37.9) days for oxcarbazepine, and 148.0 (28.4) days for clonazepam. Average costs for the cohort and per user were: \$1502/cohort, \$4843/user for lamotrigine; \$1339/cohort, \$2539/user for levetiracetam;

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\$724/cohort, \$1945/user for topiramate; \$273/cohort, \$978/user for carbamazepine; \$201/cohort, \$1130/user for phenytoin; \$186/cohort, \$858/user for gabapentin; \$115/cohort, \$873/user for oxcarbazepine; and \$18/cohort, \$97/user for clonazepam.

Conclusion: In this retrospective database study, approximately one-third of patients with partial onset seizures received adjunctive AED therapy. Retention on adjunctive therapy was high for all users. The greatest retention rates for adjunctive therapy were seen with phenytoin, carbamazepine, and lamotrigine. The greatest per cohort member and per user costs were seen with lamotrigine, levetiracetam, and topiramate.

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Professional Poster Abstract

Board#-Day
21-M

Category: Drug-Use Evaluation

Title: Antibiotic stewardship in the emergency department: assessing appropriate vancomycin loading doses

Primary Author: David Gurule; **Email:** David.Gurule@ucdenver.edu

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Purpose: Vancomycin is a commonly used antibiotic in emergency departments for empiric treatment of suspected gram positive infections. The American Society of Health-Systems Pharmacists (ASHP), Infectious Disease Society of America (IDSA) and the Society of Infectious Diseases Pharmacists (SIDP) recommend an intravenous loading dose of 25-30 mg/kg of vancomycin in seriously ill patients to achieve therapeutic concentrations that maximize drug effectiveness. We currently stock 1000 mg and 1500 mg vancomycin doses in automated dispensing cabinets in the emergency department to facilitate appropriate dosing and rapid access. The purpose of this medication use evaluation was to assess whether the dosing of vancomycin in the Denver Health Medical Center Emergency Department targeting a wider loading dose of 20-30 mg/kg was in line with the current guideline recommendations.

Methods: Approval was achieved through Colorado Multiple Institutional Review Board (COMIRB) for this retrospective chart review. Patients were identified using medication administration records from October 2012 through October 2013. All patients who received a dose of vancomycin in our adult emergency department were eligible for inclusion in the review. An individual patient chart review was then done to find the patients weight on the date of service the dose of vancomycin was administered. The mg/kg dose was calculated using Microsoft Excel and compared to the current consensus recommendations. Data was analyzed using descriptive statistics.

Results: In total, 869 patients received at least one dose of vancomycin in the emergency department. 43.5 percent of these patients received the target loading dose of vancomycin with a mean dose of 16.29 mg/kg, median of 16.69 mg/kg and a standard deviation of 5.12. Breaking down 1000 mg vs. 1500 mg, 375 patients received a 1000 mg loading dose with only 3 percent of those patients reaching the target loading dose with a mean of 13.35 mg/kg, median of 13.07 mg/kg and a standard deviation of 3.52. 494 patients received a 1500 mg loading dose with 40.5 percent of those patients obtaining an appropriate loading dose with a mean of 19.23 mg/kg, median of 19.04 mg/kg and a standard deviation of 4.77. Of note, 2% of the patients

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receiving 1500 mg received a dose greater than 30 mg/kg. 25 patients were excluded due to missing patient identifiers or unknown weights in the electronic medical record.

Conclusion: Based on these results, Denver Health Medical Center has ample room to improve the loading doses of empiric vancomycin treatment in its emergency department even with a broader loading dose goal. Less than half of the patients received an appropriate loading dose of vancomycin. This area represents an opportunity for directed pharmacy intervention to improve patient care.

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Professional Poster Abstract

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22-M

Category: Drug-Use Evaluation

Title: Evaluation of the appropriate use of vancomycin in a tertiary care hospital: indication, dose, and therapeutic level monitoring

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Additional Author (s):

Nour Chamas

Purpose: Inappropriate use of antibiotics is one of the most serious, but most controllable causes for the development of multidrug resistant organisms. Vancomycin is the cornerstone of parenteral therapy for methicillin resistant *Staphylococcus aureus* (MRSA) infections. Optimal dosing of vancomycin is patient specific due to its narrow therapeutic window. Several guidelines and reports have been developed to attempt to limit the emergence of bacterial resistance that is associated with higher rates of morbidity, mortality, and healthcare costs. The objective of this study is to evaluate the appropriate use of vancomycin focusing on the indication, dose, and therapeutic level monitoring in a Lebanese tertiary care hospital.

Methods: This observational prospective study was conducted in a tertiary care hospital over a period of two months. We collected information on 93 patients receiving vancomycin for treatment of various types of infections on all adult and pediatric wards. We evaluated vancomycin treatment both empirically and after the culture results were available. The analysis included the data collected from initiation of the first dose of vancomycin until discharge. Assessment of the appropriateness of vancomycin indication, dose, and therapeutic trough level monitoring was based on the clinical practice guidelines by the infectious diseases society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children, on vancomycin package insert, and on clinical judgment. The study was approved by the institutional review board.

Results: The intensive care unit (ICU) had around one third of the number of patients who were prescribed vancomycin (31.2 percent). In 78.5 percent (N=73/93) of the patient cases, the use of vancomycin was appropriate per indication. Vancomycin indication was considered inappropriate in 21.5 percent of patients because of the unjustified coverage of a resistant organism empirically or the failure to de-escalate to a narrower spectrum antibiotic when the culture results were available. About half of the patients were being given an inappropriate dose 51.6 percent (N=48/93) of vancomycin based on the actual body weight, estimated creatinine clearance (by Cockcroft-Gault equation), and/or indication. The percentage of patients with baseline renal impairment defined by an estimated creatinine clearance of less than 50 ml/minute upon the initiation of vancomycin was 18.2 percent (N=17/93). Vancomycin

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trough level monitoring was appropriate (defined as the timely ordering of the trough concentration when indicated) in 31.2 percent (N=29/93) of patients. Only 15.7 percent of the 166 measured troughs were within the target therapeutic level for the corresponding indication.

Conclusion: This study demonstrates a high prevalence of inappropriate use of vancomycin in our tertiary medical center. This is mainly attributable to inappropriate dosing and/or inappropriate trough level monitoring. Interventions that improve vancomycin prescribing and monitoring are needed. The presence of a clinical pharmacist as part of an infectious diseases interdisciplinary team may improve the appropriate use of narrow therapeutic window medications such as vancomycin.

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Professional Poster Abstract

Board#-Day
24-M

Category: Emergency Medicine / Emergency Room

Title: Phenobarbital for treatment of alcohol withdrawal in the emergency department

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Purpose: Pharmacologic management of patients with alcohol withdrawal syndrome (AWS) in the emergency department (ED) presents both a challenge and the potential to improve our current practices. Typically benzodiazepines have been the treatment of choice for these patients, however, AWS remains problematic. Recently phenobarbital (PB), traditionally thought of as a second line therapy, has regained attention in the literature due to its unique pharmacology including relatively quick onset and long duration of action. Two recent studies have outlined the potential downstream benefits of using PB to treat AWS in the ED. Early treatment with PB in the ED may reduce intensive care unit admissions and overall length of hospital stay. Starting in August of 2014, our ED staff at Lutheran Medical Center (LMC) began utilizing PB for the treatment of select patients with AWS. The aim of this report is to provide a descriptive analysis of PB doses administered in our ED and the admission-discharge disposition of these patients at our facility.

Methods: A pharmacist collaborated with an ED physician who has provided an educational session to the ED staff on the use of PB for acute AWS. Vigilanz surveillance software was used to identify all patients who received PB for AWS related symptoms while in the ED between August 2014 and December of 2014. For inclusion in this evaluation, patients had to have an AWS diagnosis as their primary reason for the ED visit. Patients were subdivided into a PB loading dose group (10 mg/kg IV x 1) or any low dose of IV PB. Parameters evaluated include hospital admission, intensive care unit admission and length of stay.

Results: Eleven patients were treated with PB while in the ED during the evaluation period. Four patients received PB 10 mg/kg IV x 1 loading doses (mean, 706 mg; range, 476mg to 998 mg) and seven patients received lower PB IV x 1 doses (mean, 138 mg; range, 32.5 mg to 260 mg). One out of four patients in the PB loading dose group was admitted to the hospital and six out of seven patients in the low dose PB group were admitted to the hospital. One patient in the low dose PB group was admitted to the intensive care unit. The patient admitted in the PB loading dose group stayed for 4.5 days. Average length of stay for patients in the low dose PB group who were admitted to the hospital was 2.8 days (range 2 4.5 days).

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Conclusion: Recent studies present the possibility of improving the treatment course of patients with AWS by administration of PB in the ED. This practice has been used by ED physicians at LMC for treatment of selected patients with AWS. Based current studies and data collected for this evaluation, PB may offer an alternative treatment for AWS with the potential advantage of reducing patient morbidity and mortality while limiting utilization of healthcare resources. Ongoing data collection and reevaluation is need. Further study may lead to the development of a guideline to assist with targeting appropriate patients and optimizing PB therapy.

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Professional Poster Abstract

Board#-Day
25-M

Category: General Clinical Practice

Title: Evaluation of insulin workflow and overrides utilizing barcode assisted medication administration

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Purpose: Barcode-assisted medication administration (BCMA) is known to improve safety during the medication administration process through computer verification of the five rights, including medication and patient identification scanning. High-risk medications are especially prone to administration errors that may lead to patient harm. In this institution, insulin is one of the top medications overridden through BCMA, and also one of the top medications associated with medication errors. This project was designed to identify circumstances and factors that contribute to the bypass of BCMA steps during administration of insulin, negating the value of increased safety added by the correct use of BCMA.

Methods: Two acute care units were selected for insulin administration override evaluation based on override data. Over a one-month period, one unit performed 20 insulin vial barcode overrides and another unit performed 57 overrides, two of the highest and lowest performing units with regard to overrides. Based on this data, a team of pharmacy students completed observations of nurses during the administration process to identify workflow differences between the two units. Additionally, nursing staff completed surveys related to the workflow process perceptions. With the use of LEAN methodology, value stream mapping (VSM) sessions were conducted on each of these two acute care units to identify current process steps and waste in workflow.

Results: A total of 25 observations were completed in the two acute care areas. Of these, two insulin vial barcode overrides were observed. Additionally, two nurses were observed administering insulin to the patient prior to scanning the patient identification barcode. Two insulin syringes were labeled during the administration process however 11 syringes were prepared away from the bedside and not taken directly to the patient. Nurses identified the current system for scanning the medication barcode as error prone due to location of equipment and lack of access, as well as time constraints and volume of insulin use.

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Conclusion: Multiple discrepancies were identified between high-performing and low-performing units regarding insulin administration workflow. During VSM sessions, a number of factors that may contribute to BCMA overrides in the insulin administration process were identified, including equipment accessibility and time constraints. The current state of insulin administration in our institution is not optimized and must be reviewed, as a consistently executed process can contribute to increased patient safety. There are multiple areas where the insulin administration workflow can be improved, such as syringe labeling, equipment access, and other barriers to reduce the rate of BCMA overrides.

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Professional Poster Abstract

Board#-Day
26-M

Category: General Clinical Practice

Title: Use of turoctocog alfa, a recombinant factor eight, in patients with severe hemophilia A undergoing surgical procedures

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Purpose: In hemophilia A, patients have absence or reduced production of factor eight (FVIII), which leads to abnormal hemostasis. To bring hemostasis back to its normal state, extrinsic FVIII has to be administered. Surgical intervention represents a significant hemostatic challenge in patients with hemophilia A and careful administration and monitoring of FVIII replacement therapy is critical. Turoctocog alfa (Novoeight [Antihemophilic Factor, (Recombinant)]), Novo Nordisk Inc, Plainsboro, NJ) is a novel B-domain truncated recombinant FVIII which has recently gained FDA approval. This poster will present data on the use of turoctocog alfa in surgery as well as information on stability that is relevant to administration in the hospital setting.

Methods: Data assessing the safety and efficacy of turoctocog alfa during surgery were compiled from 3 clinical trials. Two phase 3 trials enrolled adolescent and adult (guardian 1) and pediatric (guardian 3) previously treated patients with severe hemophilia A. Patients from both trials were eligible to participate in a safety extension trial (guardian 2). Informed consent was obtained from all trial participants (or parents/guardians in the case of children). Patients undergoing a surgical procedure received turoctocog alfa as a bolus injection preoperatively with subsequent dosing either by bolus injection or continuous infusion as determined by the investigator. Hemostatic response was rated at the end of the surgical procedure using a 4 point scale (none, moderate, good, excellent). Stability of turoctocog alfa after reconstitution has been assessed under both room temperature (30 degrees Celsius) and refrigerated (5 degrees Celsius) conditions.

Results: A total of 41 surgical procedures were performed in 33 patients aged 459 years. Fifteen were major surgeries in 13 patients and 26 were minor surgeries in 21 patients. Thirteen of the major surgeries were orthopedic procedures related to hemophilic arthropathy. Of the minor surgeries, 19 were dental procedures. Turoctocog alfa was administered by bolus injection in 12 of the patients undergoing major surgery, and by continuous infusion in one patient who had a simultaneous knee replacement and radial head excision. Bolus administration was used for all minor procedures. There was a 100 percent success rate, where success was defined as

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excellent or good hemostatic response. The turoctocog alfa usage ranged from 27153 IU/kg on the day of the surgery, and the total consumption of turoctocog alfa for each surgical episode ranged from 219-1502 IU/kg for major surgery and 22-746 IU/kg for minor surgery. No safety concerns were reported, and there was no evidence of inhibitor formation. The turoctog alfa label recommends administration within 4 hours of reconstitution. Extended stability testing showed that reconstituted turoctocog alfa retained greater than 83 percent of activity after 24 hours at 30 degrees Celsius and greater than 84 percent of activity after 48 hours at 5 degrees Celsius.

Conclusion: Turoctocog alfa is effective in restoring hemostasis in patients with severe Hemophilia A. In the clinical trial program, 100 percent success in the surgical setting was observed with no safety concerns. In addition, the stability after reconstitution potentially simplifies use in the hospital setting.

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Professional Poster Abstract

Board#-Day
27-M

Category: Geriatrics

Title: Drug use evaluation and cost saving analysis by comprehensive geriatric assessment for outpatients based on 2012 SNUBH inappropriate medication for elderly criteria

Primary Author: Anna Baek; **Email:** qordkssk1@naver.com

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Purpose: The Geriatric Center of Seoul National University Bundang Hospital (SNUBH) initially used the 2005 SNUBH criteria to screen inappropriate medication for elderly patients, and the list of inappropriate medication was recently revised. The objective of this study was to confirm the effectiveness of the 2012 SNUBH criteria by comparing with the 2005 SNUBH criteria. Also, this study aimed to analyze prescription alterations and cost reductions for outpatients after comprehensive geriatric assessment (CGA) based on the 2012 SNUBH criteria.

Methods: A total of 71 geriatric patients, who went through CGA at SNUBH from March 1st to August 31st of 2013, were involved in this study. To obtain the medication information prior to CGA, we interviewed the patients and called local hospitals and pharmacies to confirm previous prescriptions. The cost of drugs at the time of use was calculated by applying upper limit of the insurance fees.

Results: The 2012 SNUBH criteria screened more inappropriate medication than the 2005 SNUBH criteria did. Before CGA, the percentages of patients with inappropriate medication were 56.3% and 22.5% based on the 2012 SNUBH criteria and the 2005 SNUBH criteria, respectively ($p < 0.001$). With the implementation of the CGA based on the 2012 SNUBH criteria, the median number of medicine per patients decreased from 6.7(3.3) to 4.6(2.6) ($p < 0.001$). In addition, the ratio of having 10 or more medications and the patients being prescribed with inappropriate medications significantly declined ($p < 0.001$). The overall cost of saving through CGA was 10,966,206 won (10,097 U.S. dollars).

Conclusion: This was the first study of drug use evaluation and cost saving analysis for outpatients based on the 2012 SNUBH criteria. Our results demonstrate that medication assessment by pharmacists leads to safer and more appropriate pharmacotherapy for elderly patients.

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Board#-Day
28-M

Category: I.V. Therapy / Infusion Devices

Title: Best practices for maximizing safety technology benefits through CQI data analysis

Primary Author: Tim Hoh; **Email:** tim_hoh@baxter.com

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Purpose: Smart pump technology is intended to reduce programming errors using a Dose Error Reduction System (DERS). Facilities define soft and hard dose limits to guide clinicians during pump programming. Soft dose limits must be meaningful and consistent with clinical practice to prevent alert fatigue which can lead to active overrides or bypassing safety systems.

Methods: Infusion pump Continuous Quality Infusion (CQI) data for one US Integrated Delivery Network (IDN) were analyzed for two time periods, February 2012 and July to September 2012, to identify the frequency of soft dose limit overrides and the most common dose(s) that are overridden. The top 10 drugs with the most soft limit overrides were queried for each facility and sorted by the most common doses that were overridden and reviewed against the soft limits configured. The IDN consisted of 3 facilities with a total of 648 pumps analyzed for February and 717 pumps for July to September.

Results: The first analysis (February 2012) indicated that vasopressin had the most soft limit overrides in one facility and was also in the top 10 in another facility. It was not used in the third facility. Vasopressin had 42 soft limit overrides for two concentrations of vasopressin infusions, configured and programmed for a specific indication. The overridden doses ranged from 0.01 units/min to 0.08 units/min. The two most overridden doses were 0.04 units/min (17) and 0.02 units/min (14). The soft dose limits configured for these two concentrations of vasopressin were (0.1 to 1) units/min. The safety committee, consisting of nursing and pharmacy representatives, reviewed the data and their clinical practice protocols and concluded that the soft limits were incorrect for the intended use of this drug. Based on the analysis, the soft limits were re-configured to (0.01 to 1) units/min. Analysis of pump data for July to September indicated only four soft limit overrides for these two concentrations of vasopressin- reducing the number of overrides from 42 in one month to 4 over a three-month period. The second analysis of pump data (July to September) indicated that phenylephrine had the most soft limit overrides (376) for all facilities in the IDN. The four most common overridden doses (accounting for 63% of the overrides) were 20 mcg/min (81), 30 mcg/min (72), 200 mcg/min (49) and 25 mcg/min (34). The soft dose limits configured for phenylephrine were (40 to 180) mcg/min. The safety committee was tasked with reviewing the soft limit

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overrides and the limits consistency with clinical practice to determine how the soft limits should be adjusted to ensure meaningful programming alerts.

Conclusion: Ongoing, rigorous CQI analysis of infusion pump data improves infusion safety by ensuring meaningfulness of alerts, which prevents alarm fatigue and accidental overrides. A Best Practice for CQI Analysis is to focus on the most frequent soft limit alert overrides, assessing the appropriateness of the configured limits. This approach allows CQI review teams to identify and implement high-impact drug library improvements that support safer infusion programming and practice.

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Professional Poster Abstract

Board#-Day
29-M

Category: I.V. Therapy / Infusion Devices

Title: Pharmacy and nursing collaboration to reduce infusion device alarms

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Purpose: Alarm fatigue related to the quantity and quality of clinical alarms to which medical-staff respond has been recognized by the Joint Commission as a safety hazard requiring immediate attention. The purpose of this study is to utilize continuous quality data and staff observation to analyze infusion device alarms and develop a set of best practices for medication storage and preparation, device settings, and infusion administration processes to reduce harm associated with infusion alarms.

Methods: The alarms management team analyzed electronically transmitted alarms data retrospectively for a three month period for the most frequent types of alarms and the drugs most associated with infusion device alarms. Additionally, nursing staff across the health system participated in a survey developed by the alarms management team to assess nursing's perception of infusion related alarms. Direct observations of nursing staff using the infusion device also yielded data regarding the cause of infusion device alarms. Following analysis of electronically transmitted data, survey responses, and nursing observations the alarms management team developed a series of interventions to target the most frequent causes of infusion related alarms including staff re-education and hands-on demonstration of proper priming technique, infusion device set-up, IV container and infusion device location in relation to the patient and audio adjustment.

Results: The pre-interventional survey of nursing's perception of infusion related alarms yielded a 33% response rate across the health-system. Data derived from the electronic database as well as the survey indicated air-in-line alarms and patient-side occlusion alarms attributed to 40% of infusion related alarms observed. Following re-education of nursing staff by Super-users in conjunction with the required return-demonstration, nursing staff indicated on the post-intervention survey seeing a significant decline in alarms associated with the infusion device. Additionally, nursing staff indicated learning the steps for proper set loading of the infusion device as being the most useful educational opportunity for alarm reduction.

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Conclusion: Continuing education for nursing staff to include proper set-up, priming technique, and the location of the IV container relative to the infusion device and the patient can significantly decrease infusion related alarms. Such a reduction in infusion device alarms will contribute to the overall quality and safety of patient care.

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Professional Poster Abstract

Board#-Day
30-M

Category: Infectious Diseases

Title: Implementation of serum procalcitonin lab testing in a community hospital

Primary Author: Megan Wise; **Email:** megan.p.wise@gmail.com

Purpose: Procalcitonin (PCT) is a diagnostic biomarker that has recently become available in the community hospital setting to help guide practitioners in identifying and managing infections. It has proven to be useful in the inpatient setting for diagnosing primary bacterial infections, septic shock, and systemic secondary infections; differentiating between bacterial and respiratory tract infections; and the monitoring response to antimicrobials and determining the duration of total antimicrobial therapy. More uses for the PCT assay continue to be validated. Ultimately, the utilization of serum procalcitonin levels empower clinicians to tailor therapy, minimize costs, and decrease the risk of adverse events that are associated with antimicrobials, such as drug toxicities and C.difficile- associated infections. Lutheran Medical Center in Wheat Ridge, CO is a 338-bed non-teaching community hospital that introduced the serum procalcitonin assay in December 2014. The goal of this evaluation is to describe the characteristics of patients for whom the test was ordered in the first 90 days of its use.

Methods: A pharmacist utilized Vigilanz surveillance software to identify patients with one or more PCT levels ordered between December 1, 2014 through March 1, 2015. The admitting diagnosis and problem lists were used to determine the most probable reason for ordering the test.

Results: During the 90-day evaluation period, 142 patients had procalcitonin levels ordered. The majority of patients (54) met SIRS criteria with and without sepsis (38 percent); 50 patients with pneumonia (35 percent); six patients (4 percent) with acute exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD); and three patients (2 percent) with other lower respiratory tract infections. Other diagnoses included fever only (seven patients), leukocytosis only (seven), lactic acidosis without signs/ symptoms of infection (two), pancreatitis (two), and one patient each with bacteremia, severe asthma, abscess, cellulitis, enteritis, weakness, and altered mental status. Only six patients of the entire group had serial PCT levels measured.

Conclusion: The most evidence supporting the utility of PCT levels in guiding therapy is in pneumonia, AECOPD, lower respiratory tract infections, and sepsis. During this evaluation period, PCT levels were ordered outside of these validated diagnoses. The data reviewed here illuminates opportunities for the Antimicrobial Stewardship Pharmacist at our facility to play an active role in both educating clinicians about the validated uses of the PCT assay, and participating in developing and maintaining an appropriate-use algorithm for ordering and interpreting serum PCT levels for antimicrobial therapy decisions.

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Professional Poster Abstract

Board#-Day
31-M

Category: Investigational Drugs

Title: Ocular hypertension reduced by sustained delivery of latanoprost by thermosensitive chitosan-gelatin-based hydrogel eye drops

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Purpose: Latanoprost is one of the most potent ocular hypotensive compounds and reduces IOP by increasing uveoscleral outflow. However, daily instillations is required to maintain drug efficacy. In the present study, we developed the thermosensitive chitosan/gelatin/glycerol phosphate (C/G/GP) hydrogel eye drops as a sustained-release system of latanoprost for glaucoma treatment.

Methods: 500 mcg/ml of latanoprost-contained C/G/GP hydrogel was prepared under the laminar flow hood and well stored until further use. For In-vitro drug release, the 500 mcg/ml of latanoprost-loaded C/G/GP solution were added to the transwell (100 micro-l/well) mounted on 24-well plates, and 1.5 ml of PBS was added in each well and then incubated. The cytotoxicity of C/G/GP hydrogel eye drops on human corneal epithelial cells (HCEC) was evaluated by crystal violet assay. The protocol of the ocular irritation test was approved by the Ethics Committee for Animal Research of the Taipei Veterans General Hospital. Three female New Zealand albino rabbits with body weight approximately 2.5 kg were used and maintained in accordance with the guidelines for the care and use of laboratory animals. Ten male New Zealand albino rabbits with body weight approximately 2 kg were used and maintained in accordance with the guidelines for the care and use of laboratory animals. Ocular hypertension was induced by triamcinolone acetonide (TA). Statistical analysis was calculated using one-way analysis of variance (ANOVA).

Results: In the present study, we developed the thermosensitive chitosan/gelatin/glycerol phosphate (C/G/GP) hydrogel eye drops as a sustained-release system of latanoprost for glaucoma treatment. The results showed a sustained release of latanoprost from C/G/GP hydrogel eye drop for at least 28 days. Rabbit model of glaucoma was established by intravitreal injection of triamcinolone acetonide. After a single subconjunctival instillation of latanoprost-loaded C/G/GP hydrogel eye drop, the IOP was significantly decreased within 8 days and then maintained in normal level for the next 31 days.

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Conclusion: The results of the study suggested that subconjunctival delivery of latanoprost-loaded C/G/GP hydrogel eye drop might have the potential to improve patient compliance, reduce side effects and increase efficacy in glaucoma treatment.

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Board#-Day
32-M

Category: Leadership

Title: Increasing PharmD students knowledge of post-graduate opportunities within the biopharmaceutical industry: An analysis of the MCPHS University Fellows Network (MFN) recruitment efforts and the subsequent impact on candidate applications

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Purpose: Recent reports suggest that an increasing number of pharmacy graduates are pursuing career paths outside of hospital and retail pharmacy, such as post-graduate biopharmaceutical industry fellowships. In an effort to understand how students are learning about post-graduate positions in industry, we explored the relationship between the geographical location of recruitment events sponsored by the MCPHS University Fellows Network (MFN) and the location of the pharmacy schools that 2013 and 2014 fellowship applicants attended.

Methods: MCPHS University is affiliated with six biopharmaceutical companies that support post-PharmD industry fellowships; collectively this consortium of fellows and alumni makes up MFN. Each year, MFN attends recruitment events across the country in an effort to raise awareness of post-graduate opportunities for pharmacists within the biopharmaceutical industry. In 2013 and 2014, MFN recruitment event data were recorded and used for this analysis. Fellowship applicant data from 1 of the 6 affiliated companies (Genzyme/Sanofi) were collected in both 2013 and 2014 using the American Society of Health-System Pharmacists (ASHP) Personal Placement System (PPS) candidate messaging tool; only applicants who were currently attending or had recently graduated from an Accreditation Council for Pharmacy Education (ACPE)-accredited school of pharmacy within the United States were included in this analysis. Additionally, only fellowship program departments that recruited in both 2013 and 2014 were analyzed: Regulatory Affairs (RA), Pharmacovigilance (PV), Oncology Medical Affairs (MA-Onc), Rare Diseases Medical Affairs (MA-RD), and Multiple Sclerosis Medical Affairs (MA-MS). Regional trends were analyzed according to the American Pharmacists Association-Academy of Student Pharmacists (APhA-ASP) regional map.

Results: In 2013, MFN participated in 16 recruitment events across 10 states, including one national webinar. 60% (n=9) of the recruitment events took place in the Northeast region, 13% (n=2) in both the Mid-Atlantic and Great Lakes, 7% (n=1) in both the Southeast and Southwest,

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and zero events in the North Central, South Central, and Northwest. In 2013, 167 candidates applied to the Genzyme/Sanofi-MCPHS University Post-PharmD Biopharmaceutical Industry Fellowship program: 58 (35%) from the Northeast region, 55 (33%) from the Mid-Atlantic, 23 (14%) from the Great Lakes, 13 (8%) from the Southwest, 11 (7%) from the Southeast, 6 (4%) from the South Central, 1 (1%) from the North Central, and zero from the Northwest. In 2014, MFN participated in 37 recruitment events across 20 states, including five national webinars. 41% (n=13) of the recruitment events took place in the Northeast region, 16% (n=5) in the Mid-Atlantic, 13% (n=4) in both the Southeast and Great Lakes, 9% (n=3) in the Southwest, 6% (n=2) in the South Central, 3% (n=1) in the North Central, and zero events in the Northwest. In 2014, there were 237 applicants to the program, a 42% increase from the previous year. The number of applicants from the Northwest, North Central, Southeast, and Southwest regions all increased by more than 100% compared to the previous year. The Northeast had the largest absolute increase in applicants (2013: 58; 2014: 92), a 59% increase. The Great Lakes region showed a 9% increase in applicants; the South Central region remained consistent. Of note, the Mid-Atlantic region had a 5% decrease in applicants from the previous year.

Conclusion: The aforementioned results suggest that MFN recruitment events contributed to student awareness of post-graduate fellowship opportunities, as evidenced by the positive relationship between the number of recruitment events and the number of applicants to the Genzyme/Sanofi fellowship program. Furthermore, the expansion of recruitment events to cover more regions of the country translated into a greater geographical diversity among candidates. MFN will continue to utilize a variety of recruitment events throughout the country and across all regions in upcoming years to ensure students are learning about post-graduate opportunities for pharmacists within the biopharmaceutical industry.

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Board#-Day
33-M

Category: Leadership

Title: Pharmacy school interprofessional education models - an evaluative comparison for the future of pharmacy practice in California

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Purpose: Health professions accrediting bodies, such as the Accreditation Council for Pharmacy Education (ACPE), are advocating for an increase of interprofessional education (IPE) and some are mandating implementation of IPE training into their health profession program curriculum. The 2014 CAPSLEAD Team considered the following questions in the research study: what models currently exist at Colleges of Pharmacy (COP) / Schools of Pharmacy (SOP) in California; how do these models compare; and do they meet the standards set by ACPE?

Methods: Existing information published by the ACPE and CPhA were used to obtain this secondary data collection. The primary and secondary data collections were used to develop a focused IPE Model that can be adopted and used by COPs/SOPs to prepare students for the changing needs of pharmacy practice in California.

Results: From our research, the components of this three stage model will prepare students to enter their pharmacy careers with the appropriate level of interprofessional health care knowledge to facilitate and help them to deliver and contribute to effective patient-centered healthcare.

Conclusion: As the pharmacist duties shift to provider status, the implementation of interprofessional education will continue to reveal its importance. The proposed ACPE standards for pharmacy students, as well as new mandates for IPE for students in other health profession programs, will facilitate this need and interactions. The proposed model meets a majority of the criteria for the proposed ACPE standards, addresses skills required for the new role of provider for pharmacist, and will work to make each experience efficient and rewarding.

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Professional Poster Abstract

Board#-Day
34-M

Category: Oncology

Title: Pharmacological rationale for combining the neurokinin-1 receptor antagonist (NK1RA), netupitant, and the serotonin (5-HT₃) RA, palonosetron, as a fixed oral antiemetic combination for the prevention of chemotherapy-induced nausea and vomiting (CINV)

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Purpose: Netupitant (NETU) is a potent and highly selective NK1RA developed as a fixed oral combination agent (NEPA) with the pharmacologically distinct 5-HT₃RA, palonosetron (PALO). The NEPA combination offers guideline-consistent antiemetic prophylaxis by targeting two critical pathways associated with CINV with a single dose. PALO has been shown to uniquely exhibit allosteric interactions, positive cooperativity and persistent inhibition of 5-HT₃ receptor function. In recent mechanistic studies, NETU and PALO exhibited synergistic effects when inhibiting the substance P response and triggered NK1 receptor internalization. Expanding on this pharmacological synergy, the purpose of this analysis was to examine the pharmacokinetic (PK) profiles of these drugs in offering a rationale as to why these agents present a complementary combination for clinical use.

Methods: Data was reviewed from PK studies of NETU and PALO following single or multiple doses in healthy volunteers and cancer patients.

Results: Absorption: After oral administration, both drugs show a prolonged absorption phase with plateau plasma concentrations fluctuating around C_{max} between 3 and 8 hours. A high extent of bioavailability was estimated for NETU (63.87%) and PALO (97%), thus making the occurrence of a first-pass effect or clinically relevant interactions with efflux transporters at the intestinal level unlikely for both drugs. Bioavailability is similar in fed or fasting conditions for both drugs. Distribution: NETU and PALO show a large volume of distribution (V_z/F: ~15003000 L for netupitant; ~500900 L for palonosetron). Binding to plasma proteins is high for NETU (f_u<1%) and its active metabolites (f_u<3%), and relatively low for PALO (f_u=38%). Elimination: Both compounds are largely metabolized. The principal isoforms responsible for their metabolism are CYP3A4 for NETU and CYP2D6 for PALO. No drug-drug interactions occurred between NETU and PALO administered as single agents or in combination. NETU and its metabolites are mainly excreted with feces (87% of the administered dose) whereas PALO and its metabolites are predominantly excreted via the renal route (85-93%). The systemic

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clearance (CL/F) is similar for the two drugs, ranging between 20-23 L/h for NETU and 10-18 L/h for PALO. Both compounds show a long terminal half-life ($t_{1/2}$ 80-100 h for NETU and 30-40 h for PALO), as a result of their intermediate-to-low CL/F, very large V_z/F and low f_u for NETU. Based on $t_{1/2}$ estimates, no NETU or PALO accumulation is predicted when NEPA is administered in conjunction with chemotherapy cycles at 2- or 3-week intervals. Key PK parameters (i.e., CL, V_z , $t_{1/2}$) of both drugs did not change following multiple doses as compared to single dose values, indicating PK linearity.

Conclusion: Similar and complementary PK profiles of NETU and PALO support the pharmacological rationale of using these agents as a fixed combination for prevention of CINV. The absorption characteristics of both agents offer the potential for flexibility in timing of dosing prior to chemotherapy; however, this would need to be evaluated in clinical studies. The long half-lives of NETU and PALO support prolonged receptor occupancy and efficacy during both the acute and delayed phases following a single dose per chemotherapy cycle. Involvement of different enzymes in NETU and PALO metabolism, large differences in plasma protein binding and in elimination routes favor the lack of drug-drug interactions between NETU and PALO at metabolic, binding or excretory level, thereby minimizing the potential for increased adverse events. While the inhibitory effect of NETU on CYP3A4 may increase exposure of co-administered CYP3A4 substrates, it does not alter the PK of PALO. This review of the PK profiles of NETU and PALO combined with the synergistic effects on receptor antagonism, offers a compelling rationale for the clinical use of the NEPA fixed combination.

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Board#-Day
35-M

Category: Pediatrics

Title: Evaluation of Modifications to Care Set Driven Intravenous Immune Globulin Prescribing Habits for Kawasaki Disease at a Pediatric Hospital

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Purpose: To evaluate the impact care set modification has on prescribing habits and infusion times for patients receiving IVIG for treatment of Kawasaki Disease and to record the number of adverse effects associated with infusion of IVIG prior to and after the changes implemented in the CPOE system

Methods: A single center, retrospective chart review conducted from April 15th, 2012 to April 15th 2013 which included 6 months prior to and 6 months after the implemented care set change control measure on October 15th, 2012. Institutional Board Review approval was obtained prior to data collection. Inclusion criteria was all inpatients who received high dose IVIG (2gm/kg) for suspected Kawasaki Disease or Kawasaki Disease and exclusion criteria was all inpatients who received high dose IVIG (2gm/kg) for other indications. Data collected included Age, Weight, Sex, Allergies, SCr, diagnosis, prescribing service, need for administration of emergency medication, dose of IVIG, infusion time and adverse effects within 48 hours of administration. Adverse effects were defined as headache, abdominal pain, vomiting, anxiety, nausea, fever, chills, myalgia, and anaphylaxis.

Results: Percentage of prescriber ordered IVIG for Kawasaki Disease patients at the inappropriate rate decreased significantly ($p < 0.001$) after the introduction of the updated order care set. The number of adverse effects appears to have decreased when the proper infusion rate was administered. It was found that modifications to the cares sets led positive changes in physician rate prescribing behavior.

Conclusion: Comparisons against adverse effects observed in patients who received IVIG at other doses and rates were not included in this review and would be needed to determine if this is a significant finding. When encountering the updated orders, unaware prescribers contacted a pharmacist regarding the changes to infusion time. This provided a teaching opportunity from the pharmacist about the potential infusion related adverse effects and other drug information. Modifications to the cares sets led to an increase in the percentage of IVIG

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ordered at the appropriate rate for KD and were associated with a decrease in adverse infusion reactions.

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Board#-Day
36-M

Category: Pharmacokinetics

Title: Effect of plasmapheresis on levetiracetam and lacosamide serum concentrations

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Purpose: Plasmapheresis is an effective treatment for many disease processes that affect the immune system. While removal of autoantibodies via plasmapheresis can be a lifesaving procedure, the process also has the potential to remove drug from the body. In some cases this is desirable. In others where removal of medication is not a goal of therapy, the potential for exacerbation of medical conditions controlled by those medications is possible. Little is known about the effect of plasmapheresis on many of the newer antiepileptic agents. Here we present the case of a patient receiving intravenous levetiracetam and lacosamide, and the effects of plasmapheresis on the corresponding serum concentrations.

Methods: The patient was admitted with thrombotic thrombocytopenic purpura believed to be related to a previously undiagnosed ovarian mass. During her hospitalization, the patient experienced new-onset seizure activity which continued for several days. Intravenous levetiracetam and lacosamide were two of the medications employed for the control of the patients seizures. Serum levels of both medications were obtained pre and post-plasmapheresis for the purpose of evaluating whether removal of the drugs from the serum may have been contributing to the ongoing seizures.

Results: The patients doses of levetiracetam (1500mg twice daily) and lacosamide (200mg twice daily) had been unchanged for approximately four days prior to sampling giving both time to reach steady state concentrations. Serum levels were assessed prior to the initiation of plasmapheresis, and again before the administration of the next dose of medication after plasmapheresis was concluded. Levetiracetam and lacosamide were infused 3 hours and 46 minutes, and 3 hours and 9 minutes respectively prior to the procedure. Drug distribution for both medications is assumed to have been complete by the time plasmapheresis was initiated. The pre-plasmapheresis levels of levetiracetam and lacosamide (26 milligrams per liter and 8.4 milligrams per liter) were both within the generally accepted therapeutic ranges. After the removal of 3,084 milliliters of plasma over 2 hours and 7 minutes, plasmapheresis concluded. Post-procedure sampling was completed 9 minutes later. The serum level of levetiracetam (15 milligrams per liter) and lacosamide (5.7 milligrams per liter) remained therapeutic. Using the measured serum concentration of each medication, the volume of plasma removed, the

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patients weight, and the volume of distribution of each medication as provided by the manufacturers, the calculated percentage of medication removed by plasmapheresis was 10% for levetiracetam and 8% for lacosamide.

Conclusion: Plasmapheresis appears to have little effect on the serum concentrations of levetiracetam or lacosamide.

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Board#-Day
37-M

Category: Pharmacy Technicians

Title: Expanding Roles of Pharmacy Technicians in Medication Safety Initiatives

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Purpose: Implementation of pharmacy technology has resulted in expansion of medication safety initiatives. The improvements associated with these programs are dependent upon adherence and maintenance of the technology. Pharmacy technicians with specialized training in medication safety practices enhance patient care programs and allow for reallocation of limited resources. This is an evaluation of enhanced pharmacy technician roles in the patient safety process of barcode medication administration (BCMA) and outcomes associated with nursing satisfaction along with reduction in pharmacists work flow disruptions.

Methods: St. Elizabeths Hospital is a 300-bed community teaching hospital with barcode medication administration implementation in 2010. To improve barcode medication administration compliance rates above 97.5%, the Pharmacy Department assumed full management of the barcode medication administration process in 2014. To maintain this rate of adherence significant pharmacists resources were required with approximately 20 hours monthly associated with monitoring and an average of 15 nursing calls daily relating to barcode medication administration scanning issues. A technician training program was developed and implemented by the Pharmacy Unit Partnership Council (UPC) technician representative, Medication Safety Pharmacist and Pharmacy Informaticists. The programs objects were to expand the pharmacy technicians understanding of barcode medication administration processes and abilities in triaging nursing inquires. Investigational Review Board approval was obtained. Pre- and post- nursing surveys in addition to the number of barcode medication administration related calls resolved by pharmacy technicians were measured.

Results: Improvement in nursing barcode medication administration process satisfaction scores corresponded to the implementation of pharmacy technicians role as primary liaison for scanning related issues. The average number of pharmacy technician triaged barcode medication administration calls significantly increased with a corresponding 50% reduction in barcode medication administration issues resolved by pharmacists. In addition, partial responsibility for the monitoring of barcode medication administration compliance was

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assumed by the UPC technician, thereby reducing the Medication Safety Officers hours spent on reporting. However, neither the number of scanning alerts nor barcode medication administration compliance rates were noted to change after implementation of the pharmacy technician training.

Conclusion: Expanding the roles of pharmacy technicians in medication safety initiatives improves nursing satisfaction with barcode medication administration related processes while reducing pharmacy workflow interruptions.

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Board#-Day
38-M

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Community pharmacists' attitudes towards mental illness and providing pharmaceutical care for mentally ill patients

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Purpose: To examine the attitudes of community pharmacist toward both mental illness and provision of pharmaceutical care and explore the barriers that may limit its implementation as well as facilitators that make implementation of pharmaceutical care easier.

Methods: The survey is composed of 4 sections. Section 1 collected demographic characteristics of the respondents. Section 2 asked 6 Likert type questions attributed to the attitudes of the pharmacists toward mental illness. Section 3 asked questions about the attitudes of community pharmacists toward providing pharmaceutical care to mentally ill patients and differentiated between different types of mental illness and compares them with cardiovascular medications. Respondents were asked to indicate the degree of interest, comfort and confidence to provide various functions of pharmaceutical care to mentally ill patients. Section 4 asked what parries make it difficult to provide pharmaceutical care as well as facilitators that makes implementation of pharmaceutical care easier. Data were collected via face-to-face encounter using pre-tested questionnaire

Results: Forty three pharmacists participated in the study. Eighty-eight of the pharmacists felt that mental illness is the same as other illness. Nearly two third of the respondents strongly agree or agree with the statement that mentally ill patients are easily recognizable. Only one third of respondents disagree or strongly disagree with the statement that mentally ill patients have not the ability to tell right from wrong. In general 43.3%-87.7% of respondents are being "much more" or "more" interested, comfortable and confident to perform different pharmaceutical care functions to mentally ill patients. With regard to the different types of mental illness the respondents expressed varied attitudes toward providing pharmaceutical care to mentally ill patients depending on the type of mental illness. An average range of 30-67% of respondents felt neutral or "much more" or "more" comfortable, confident screening for, solving drug-related problems and monitor for efficacy, adverse effects and compliance with drug therapy. Additionally, the respondents felt that they screening and solving drug-related problems and monitoring mentally ill patients less frequently than patients with cardiovascular medications. Several demographic characteristics including age, year in practice, those with family history of mental illness and experience with mental illness were associated with attitudes toward providing pharmaceutical care to mentally ill patients. Various barriers that limit the provision of pharmaceutical care were identified by the respondents. These include Lack of training in pharmaceutical care practice (88.4%), lack of therapeutic knowledge

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(83.7%), lack of documentation skill (79%), lack of communication (76.8%), lack of space for counseling (76.7%), insufficient time (74.5%) and lack of staff (72.1%).

Conclusion: Although pharmacists have generally positive attitudes toward both mental illness and providing pharmaceutical care to mentally ill patients, they felt uncomfortable counseling or follow-up monitoring patients for adverse drug-related problems when consider distinguishing between different types of mental illness.

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39-M

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Physician perceptions and challenges of integrating clinical pharmacist practitioners into practice in North Carolina

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Purpose: There were 145 (1.3%) pharmacists registered in North Carolina in February 2015 who were also licensed as Clinical Pharmacist Practitioners (CPPs) to provide collaborative disease management under the supervision of a physician. To direct efforts to increase the number of CPPs incorporated into patient care teams, more information is needed on physician attitudes regarding working with CPPs. This study was conducted to describe the perceptions of physicians toward integrating clinical pharmacist practitioners (CPP) into their medical practices. Secondary objectives are: determining differences in attitudes of physicians who have supervised CPPs versus those who have not supervised CPPs, and differences in attitudes of physicians based on demographic data.

Methods: A link to an anonymous, voluntary electronic survey instrument was sent to 133 active CPPs, who were asked to share the survey with 239 CPP supervising physicians, and a mailing with a link to the electronic survey instrument was sent to a random oversample of 478 non-CPP supervising physicians. The survey was also given to a convenience sample of 53 physicians who had not previously responded at a statewide family medicine faculty retreat. Respondents were queried regarding provider and practice site demographic information, services provided by CPPs, and benefits and barriers of working with a CPP. Descriptive statistics include frequency (percent), and responses of CPP supervising physicians were compared to those of non-supervising physicians using Chi Square test. This study was approved by the Institutional Review Board at the University of North Carolina at Chapel Hill.

Results: Fifty (20.9%) CPP supervising physicians and 13 (2.5%) non-CPP supervising physicians responded. Sixty one (95.3%) of the respondents were somewhat to very interested in working with CPPs [5-point Likert scale: 1- not at all interested, 2- somewhat interested, 3- neutral, 4- somewhat interested, 5-very interested]. CPP supervising physicians identified enhanced clinical outcomes (86.0%), access to drug knowledge (62.0%), and creation of an interdisciplinary model (56.0%) as the top benefits of working with a CPP. Likewise, enhanced

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clinical outcomes (84.6%), access to drug knowledge (76.9%), and creation of interdisciplinary models (30.8%) were the top benefits identified by non-CPP supervising physicians. Primary barriers reported by CPP supervising physicians included limited reimbursement (56.0%) and billing difficulties (46.0%). Similarly, non-CPP supervising physicians identified billing difficulties (46.2%) and limited reimbursement (30.8%) as the top barriers. No specific relationships were found between practice or provider demographics and CPP supervision.

Conclusion: Irrespective of experience with CPP supervision, physicians identified enhanced clinical outcomes, access to drug knowledge, and creation of an interdisciplinary model as the top benefits of inclusion of a CPP in the practice, while billing difficulties and limited reimbursement were reported as the most common barriers. While the majority of respondents were interested in working with CPPs, reimbursement is a significant challenge to integrating CPPs into physician practices. This emphasizes the importance of advocacy efforts to recognize advanced pharmacy practitioners as providers, and the need to restructure funding models (i.e. move from fee for service to pay for performance, shared savings, capitation, etc.). Sharing current best practices of those who have successfully overcome these barriers may help to increase the numbers of CPPs in practice.

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Board#-Day
40-M

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Post-marketing adverse drug reactions associated with major bisphosphonate medications: calculating downstream costs.

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Purpose: Pre-approval clinical trial programs often fail to have adequate patient numbers, diversity, and/or drug exposure times necessary to uncover many adverse events (AE) and poor patient outcomes that occur during real-world drug usage. Indeed, safety information regarding FDA-approved drugs is oftentimes heavily weighted towards pre-approval information summaries gathered from relatively homogenous patient populations rather than constantly evolving reactions seen in heterogeneous post-approval patients. Accordingly, active and on-going monitoring of post-marketing data is vital for meaningful analyses of drug safety. The safety burdens and downstream costs of AEs and poor outcomes represent significant issues for the healthcare system. We wanted to develop a method that could quantify these risks in broadly relatable monetary terms. Quantification of specific downstream AE and outcome costs collected during a drugs post-marketing phase might provide an improved method for assessing treatment options with regard to safety and real-world financial impacts.

Methods: Post-marketing costs associated with AEs and outcomes for individual drugs were estimated by: 1) obtaining all primary suspect case report data from the FDAs Adverse Event Reporting database (FAERS) for each drug studied during the time period of 2010-2014, 2) mapping ICD-9 codes, and their corresponding AHRQ-derived AE and outcome-specific survey costs, to MedDRA Preferred Terms (PTs) used in FAERS to calculate total cost burdens for each drug, and 3) using drug usage data (provided by Evaluate Pharma) to translate total costs to a per patient exposure cost. We focused our analyses only on PTs that were Important Medical Events as defined by EudraVigilance. In each case only one AE or poor patient outcome with the highest individual cost was used in the calculations. Five bisphosphonates were analyzed in detail.

Results: From lowest to highest, total and average downstream costs per patient exposed were: zoledronic acid (Reclast) (\$45,532,511 = \$1,433.91 per patient); zoledronic acid (Zometa) (\$105,268,432 = \$166.72); ibandronate sodium (\$33,976,551 = \$17.68); alendronate sodium (with and without cholecalciferol) (\$130,667,886 = \$13.79); and risedronate sodium (\$10,600,958 = \$4.54). Under reporting of AEs may result in the estimations above being low.

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Conclusion: AEs and poor outcomes that occur during a drugs post-marketing phase can often represent both significant safety concerns and large cost burdens for the healthcare industry. The method discussed here assigned monetary estimates on such downstream burdens. Individual drugs from the bisphosphonate class show varied AE profiles and, accordingly, the range of downstream costs noted here had a broad range. We feel that this method can serve an unmet need in drug safety analysis.

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41-M

Category: Quality Assurance / Medication Safety

Title: Pharmacy medication safety initiatives: experience at a tertiary women's and children's hospital in Singapore

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Purpose: To Err is human. Medication errors and near misses arise throughout the whole continuum of prescribing, dispensing and administration of the medication use process. Pharmacy play a key role by being the gate-keeper in performing the right intervention at the right time. There is thus a need for hospital to have a strategic plan for medication safety as errors involving medication use make up largest single cause of medical errors In hospitals. With the current hectic pace of health care where immediate patient needs are prioritized over long-term planning for patient safety, Pharmacy department actively balances these short term needs of patients with the long term plans for patient safety. As safe medication use requires careful planning and resources, the aim is to increase the awareness with the implementation of new and novel ideas, collaborative efforts and fostering of a culture of patient safety in the Pharmacy Department.

Methods: The ISMP Model Strategic Plan for Medication Safety is adopted. This involves seven specific goals that aim to tackle specific areas of interest ranging from creating and demonstrating a leadership-driven culture of safety, improving error detection and using the information to improve medication safety by using technology to assist in reducing medication errors. Procedures in mitigating the risk of errors with high-alert medications, having a blame-free culture and involving the community in medication safety initiatives and medication self-management programs are rolled out. A well-controlled formulary with medications selected based on safety instead of cost is implemented to promote a safety culture in pharmacy.

Results: The setting up of Pharmacy Medication Safety Committee with involvements of pharmacy technicians to pharmacists from different sections looking into improving processes and imparts medication safety culture on the ground. This has helped in improving intersectional communications where issues are discussed at this platform. All medication errors will undergo root cause analysis to look into system processes and recommends changes and improvements. We review near miss data / action plans on medication errors, LASA, drug descriptions, alert tags and trending of MERP Category D and above errors. Prospectively, FMEA are conducted on critical near misses to ensure processes are in place to prevent errors.

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Pharmacy leverages on close loop medication management (CLMM) and 24 hours pharmacist verification and barcode labelling. Our computerized physicians order entry (CPOE) is interfaced over to pharmacy robot for unit-dose barcode packing and barcode drug administration in the ward. We have also implemented a pick to light at outpatient dispensary and light guided automated dispensing cabinets (ADC) in the operating rooms. Restriction of access to concentrated electrolytes and heparin injections at the ward floor, using pre-mixed commercial preparations and pharmacy preparing individualize electrolyte drips for wards, with independent counter-checking upon administration has resulted in reducing the risk of errors. We encourage the Just Culture behaviour on looking into system vulnerabilities and processes but with minimal tolerance to conscious disregard of clear risks to patients. We engage stakeholders (drug vendors, patients and caregivers) in medication safety initiatives such as PILS and flipcharts. Our selections of medication are based on safety rather than cost. We streamline the formulary to minimise therapeutic duplications and ensuring availability of barcodes on packaging of medication.

Conclusion: With the establishment of a blame free environment which allows staff to report near miss and errors, lessons are learnt from incidents raised to ensure that relevant changes can be made. Pharmacy staffs are open to discuss and provide ideas and suggestions, where best practices are then implemented to ensure medication safety is everyone's priority.

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42-M

Category: Quality Assurance / Medication Safety

Title: Evaluation of video clip service for inhaler education in patients with respiratory problem

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Purpose: Inhalation is the preferred route of drug administration in patients with respiratory problem. Inhaled drug acts in the airways directly and rapidly, and has fewer systemic side effects than oral medication. However, the effectiveness of inhalers is mainly dependent on inhalation technique and this indicates the importance of inhaler technique education. At Samsung Medical Center (SMC), patients were referred to the respiratory counseling service center (RS) for inhaler educations. The pharmacist in RS taught patients about inhaler thoroughly and provided the leaflets. Recently, RS produced the video clips for inhaler instructions, and have started sending them to patients via their smartphones to improve understanding about inhalation medication use. The aim of the present study was to assess video clip service via smartphone and to find an optimal patient education method.

Methods: The telephone surveys were conducted among patients who agreed to receive video clips via smartphone in July to September 2014.

Results: 77% of patients were very satisfied with the counseling services regardless of videos. From the educations, patients wanted to know the most how to use inhalers (45%). And then, the purpose of medication and information on diseases came in second at 24%, followed by adverse drug effect which accounted for 14%. On the other hand, 25% of patients agreed to receive video clip messages and 75% denied. And only 56% of patients who had received messages watched the video. The viewer said the video contents were very understandable (91%) and helpful to get more information (36%). Viewers watched the videos at the time of right before inhaler use (56%), right after counseling (22%) or during the inhaler use (22%). The patients who didnt watch the videos (44%) answered they thought face-to-face counseling and the leaflet were enough to understand inhaled medication (60%). Or they forgot about the messages (40%). Among the patient education methods, the most effective way that patients chose was face-to-face counseling (64%), and followed by instructional videos (27%) and medication guide leaflets (9%).

Conclusion: According to this study, patients were very satisfied with current patient education services and face-to-face counselling was most effective way to teach them. Although this study did not show the smartphone-based video clips was a best tool for the patient education, the video clip is a valuable tool because it can remind patients of inhaler technique, whenever the need arises. And it can overcome the limitation of verbal instruction that is easy to be

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forgotten, especially as time goes by. In this study, the actual viewer rating was only 56%. To improve the effect of smartphone video education, it is necessary to teach the patients how to access the smartphone video clips and encourage them to watch it.

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Board#-Day
43-M

Category: Quality Assurance / Medication Safety

Title: Underrecognized intravenous drug administration errors in an integrated electronic health record to smart pump platform.

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Purpose: Hospitals are increasingly implementing safety mechanisms designed to provide safer medication administration such as computerized order entry and barcode medication administration. Electronic health records (EHRs) integrated to a smart pump platform is a technology also being used by a few organizations to enhance safety. Integrated systems increase safety by eliminating or reducing intravenous (IV) errors, and improving compliance with drug library use. They are efficient and can reduce variances seen with manual pump programming. Previously, nurses documented on flow sheets and in patient progress notes which were the main sources of knowing the actual rate of IV drug administration. Integrated systems may help provide medication administration data and identify IV drug administration errors, which were previously unknown.

Methods: This retrospective quality improvement project was designed to evaluate how often end users in an adult intensive care unit were altering an ordered rate of an IV medication. The evaluation included patient EHRs and smart pump records from August 1, 2014 through October 31, 2014. A mismatch report was generated when there was a variance between the ordered rate and the actual rate at which the medication was infused, after the user validated the information in the EHR. Amiodarone bolus doses, used in postoperative cardiac surgery, were selected for this project since they were frequently flagged and had a defined rate of infusion. A total of 138 charts were reviewed. In addition, walk-through observations and an anonymous survey was given to staff nurses to identify reasons medications were administered at a different rate than ordered. Data collected for this project has been deidentified (without specific patient identifiers). This study is exempt from approval by the Investigational Review Board as it is being used primarily for quality improvement within the health system.

Results: Preliminary data from the survey and walk-through observations identified varying methods of assessing the patient, as well as potential mis-beliefs about the effects of a medication which resulted in altering the administration rate. Further, hold parameters and instructions to administer amiodarone were interpreted and applied inconsistently. The top IV administration errors were as follows: order was accepted in electronic medication administration record (eMAR) but administered at a lower infusion rate (28.9 %, n=40); order

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was changed in the eMAR, then sent to the smart pump (7.2%, n=10); and doses were titrated (5.8%, n= 8). While 57.2 % (n=79) of the bolus dose was given as ordered, only 28.9 % (n = 40) of doses were flagged in the mismatch report leading to hidden administration errors in 7.2% of cases. Additional errors included a lowered bolus rate given concurrently with the maintenance amiodarone infusion as well as priming the line with a higher concentration maintenance dose. The latter was evident in 72% (n=57) of doses given as ordered (n=79), leading to an extra 15.9% bolus dose administration.

Conclusion: Smart pump data can be an extremely helpful resource to identify varying practices among end users during IV administration. After data is reviewed, gaps and practice differences can be identified then used to determine reasons IV medications are not administered as ordered. Results can lead to practice and cultural changes or act as a basis for identifying opportunities for further research within certain disease states. Institutions should work with smart pump and EHR providers to identify ways to generate user-friendly reports as well as review the reports to identify areas of weakness/risk, so error-reduction strategies can be developed and implemented.

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44-M

Category: Quality Assurance / Medication Safety

Title: Implementation and benefits of interoperability between the electronic medical record (EMR) and infusion pump

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Purpose: Intravenous medication errors are twice as likely to cause harm to patients as medications delivered via other routes of administration. The point of administration is the last opportunity to identify and prevent a medication error. This project was designed to implement a closed loop system of interoperability between the electronic medical record (EMR) and the infusion pump. Instead of manually programming the pump using the keypad at the bedside, the pump can be pre-populated with infusion parameters from a verified physician order through scanning a barcode on the pump, patient and medication. The goal of implementing interoperability was to reduce medication errors, simplify and improve clinical documentation and increase infusion management leading to better charge capture and a reduction in lost revenue.

Methods: A project kick-off was done in October 2013 with a multidisciplinary team. System-wide and local steering committees were formed consisting of members from pharmacy, nursing, quality, clinical informatics, information technology, clinical engineering, project management, education, and the EMR and infusion pump vendors. The infusion pump drug library was updated to accurately reflect dosing parameters and medication identifiers consistent with the EMR. Rounds were done with bedside nurses to evaluate the workflow and determine changes that may be necessary for interoperability to work. The medications and clinical documentation in the EMR were changed to include required fields necessary for infusion pump interoperability. Testing was conducted to validate the accuracy of interoperability, followed by training of identified nursing superusers and all end users. The project duration was seven months from kick-off to full implementation.

Results: Interoperability between the EMR and infusion pumps was fully implemented on May 13, 2014, on all care units excluding the Neonatal Intensive Care Unit and procedural areas such as the operating room and cath lab. Pre-population of infusion parameters reduced manual key strokes on the pump on average from 15 to 2 per infusion programmed, a reduction of 86%.

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The total guardrails suite usage on the infusion pump increased from a monthly average of 91.76% to 94.38%. The patient identification usage on the pump increased significantly from 35.54% to 80.96%. The average number of total monthly pump alerts decreased by 22%, from 1845 to 1447 per month; and average monthly override alerts decreased by 20.5% from 1560 to 1240 per month. The number of infusions requiring reprogramming in the pump decreased 19% from an average monthly number of 119 to 96, and the number of cancelled infusions decreased by 33% from 166 to 111 per month. The 2014 self-reported safety events related to infusion pump programming were reduced from 3 to 1 after implementation. In the one event after May, 2014, interoperability was not used. If it had been, the event would have likely been prevented. There was a 16.8% decrease in lost charges due to missing documentation for charge capture. This accounts for a \$35,443.20 annual savings. Our hospital has done significant work prior to go-live to improve documentation and reduce the lost revenue, but as a system of eight hospitals, if we had a similar reduction after all go-live, it would be a \$651,045 improvement in lost charges. The compliance on the use of interoperability was tracked weekly and averaged 70-80% compliance with pre-populating the infusion parameters from the EMR to the infusion pump directly. Further education to end users and changes to the pump drug library and the EMR have been made based on the weekly compliance results.

Conclusion: Infusion pump interoperability implementation was shown to improve safety, enhance efficiency of documentation and provide financial benefits through increased charge capture. Implementation and maintenance of interoperability requires active participation of all key stakeholders.

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45-M

Category: Quality Assurance / Medication Safety

Title: Demonstrating the importance of using weight-based safety parameters for intermittent syringe pump infusions

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Purpose: Historically, smart infusions pumps with Dose Error Reduction Systems were initiated to increase safety around programming of continuous infusion modes on large volume infusion pumps. Therefore, much of the published literature related to smart infusion pumps and safety events is focused on continuous medications. Due to the focus on continuous medications, there is often the perception that intermittent infusions are less prone to programming errors and/or do not require as rigorous safety parameters, such as use of weight-based drug programming. The purpose of this study was to describe the impact weight-based safety parameters may have on the occurrence of potential programming errors for intermittent syringe pump infusions.

Methods: Data from 10 pediatric in-patient hospitals utilizing Medfusion 4000 Syringe Infusion pumps and PharmGuard Server was retrospectively evaluated from the time period of January 1, 2013 to December 31, 2013. Data from a total of 4,162 pumps, 943,448 total infusions, and 810,359 intermittent infusions were reviewed. The data were analyzed based upon recorded safety events and infusion types for weight-based (dose/kg/time) (WB) and non-weight based (volume over time) (VOT) intermittent infusions. Safety events included abandons, soft limit reprograms, soft limit overrides and hard limit alerts. Analyses were performed using a Chi-squared test for independence to compare the relationship between infusion type and occurrence of a safety event.

Results: Of the 810,359 intermittent infusions, WB infusions accounted for 51.7% (419,296) and VOT infusions accounted for 44.9% (363,408), and other intermittent modes accounted for the remaining 3.4% (27,655). Of the 782,704 WB and VOT infusions, a total of 39,049 safety events were recorded, with at least one safety event reported in 6.9% (29,324) and 1.7% (5,880) of WB and VOT infusions, respectively. Weight-based infusions had the higher percentage of safety events (83.3%) between WB and VOT (16.7%) infusions. A relationship was confirmed between infusion type and the occurrence of a safety event ($p < 0.001$). The safety event triggers were: dose (WB 59.7%, VOT 0.0%), main time (WB 27.3%, VOT 76.6%), weight (WB 9.2%, VOT 0.0%), volume (WB 0%, VOT 23.4%) and concentration (WB 3.8%, VOT 0%). WB infusions had a higher

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percentage of safety events for each safety event type: soft limit overrides (WB 88.8% VOT 11.2%), hard limit alerts (WB 74.4%, VOT 25.6%), soft limit reprograms (WB 85.1%, VOT 14.9%), and abandons (WB 88.9%, VOT 11.1%).

Conclusion: The results of this retrospective study describes the significance of intermittent infusion modes in relation to syringe pump use and the large percentage of intermittent infusions where a medication safety event was potentially avoided due to the use of a smart infusion pump and safety limits. Weight-based intermittent infusion modes are shown to prevent potential programming errors and should be utilized versus non-weight based intermittent infusion modes.

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46-M

Category: Quality Assurance / Medication Safety

Title: Development and use of audit tools for health system pharmacists to survey controlled substance utilization at ambulatory care areas serviced by the hospital main pharmacy

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Purpose: Health System affiliated ambulatory care sites have become significant sources for personnel to divert and abuse controlled substances. Less than optimal oversight by the hospital main pharmacy that supplies narcotics and other scheduled drugs to these sites can result in quality, regulatory, and liability issues, including affronts to patient safety. An evaluation mechanism is needed for comprehensive analysis and monitoring of controlled substance utilization in these facilities on a regular basis. The purpose of the program is to improve controlled substance management and mitigate the risk for diversion within ambulatory care sites.

Methods: Pharmacy department personnel developed an ongoing monitoring and assessment program for controlled substance use in ambulatory care sites serviced by the hospital main pharmacy. The program was developed in alignment with a robust policy and procedure for handling of controlled substances in ambulatory care settings. Audit tools were developed through expansion and modification of a generic inspection form previously used to complete regulatory pharmacy inspections of ambulatory medication use sites. An emphasis was placed on ensuring compliance with requirements established by the Drug Enforcement Agency. The resulting documents focus on all aspects of controlled substance use in multiple types of health system affiliated ambulatory care sites.

Results: Four distinct audit tools were developed for each type of ambulatory care site serviced by the hospital main pharmacy. These included ambulatory care clinics, community and specialty pharmacies, surgical centers and medical procedure units, and infusion pharmacies. Each audit tool contains a tabular list of items to be surveyed relating to controlled substance handling, which includes registration, ordering, receiving, transferring, storage and security, dispensing, administration, wasting, inventory, auditing, discrepancy management, and handling of expired or unused controlled substance medications. There is a check grid provided for yes, no, and not applicable responses for each of the listed items and a resolution and notes section for necessary follow up or corrective action. The completed audit tools are evaluated for regulatory conformance and trending comparisons. Findings and recommendations for improvement are provided to each area upon completion of the inspection. On average,

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approximately five recommendations for improvement have been provided to each site. Each inspection required an average of forty five minutes. It is projected that the number of recommendations for improvement and time required to complete each inspection will decrease as repeat inspections are performed.

Conclusion: The audit tools described have been adopted as health system policy and procedure for performing controlled substance audits at regular intervals for all ambulatory care sites serviced by the main hospital pharmacy. These reports have proven invaluable for providing a clear picture about how controlled substances are managed in these facilities, and to ensure the chain of custody for controlled substances is maintained at all times. The information obtained can be used to confirm that quality assurance measures are in place and that continuous quality improvement occurs. Identification of any controlled substance irregularities in the inspected areas will trigger prompt and corrective action so that quality and regulatory compliance is maintained and patient safety is not compromised.

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47-M

Category: Quality Assurance / Medication Safety

Title: Meeting the challenge of modernizing sterile compounding

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Purpose: Non-compliance to United States Pharmacopeia Chapter 797 (USP <797>) for Sterile Compounding standards endangers the quality and safety of compounded sterile products. These standards are not just best practices but are, in many states, considered legal standards that must be met for operational licensing. However, many facilities face formidable environmental challenges to meet these standards. Environmental improvements are only effective if a facility's policies and procedures are reviewed, revised, and strategically implemented. This report will describe the process needed to bring online a new USP <797> compliant facility while expanding the existing sterile compounding service line.

Methods: The Pharmacy Department management team designated a point person from Pharmacy Administration and a technician leader to work together to bring the new facility online. This team performed intensive review and training on current USP <797> best practices through academic study of regulations, participation in practical continuing education, and consultation with subject matter experts. The team also reviewed the pharmacy's existing sterile compounding service including policies, procedures, facilities, training methods, materials, and record keeping practices. Revisions were made to existing policies, procedures, protocols, training, and record keeping processes and, when required, new policies and processes were created over a period of two months while the new facility was under construction. Changes in supplies needed for sterile compounding and maintaining the new facilities were also identified. Interdepartmental cooperation with Materials Management and Environmental Services was key to the development and implementation of the upgraded sterile compounding service. Prior to implementing the new facility, pharmacy and environmental services staff were appropriately trained and the completed facility was inspected. Protocols for continual quality improvement were also written and implemented.

Results: Within two months, the transition was made to the more USP <797> compliant facility. New and revised Sterile Compounding and Hazardous Drug Policies were passed by the Pharmacy, Therapeutics and Dietary Committee. The skill and competency of pharmacy staff

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compounding sterile products was tested. The confidence of pharmacy personnel in the quality of compounded sterile products increased. The new facility allowed for reduced reliance on compounded sterile products from outside vendors and allowed for chemotherapy to be added to the service line, utilizing a new, negative pressure room and compounding aseptic containment isolator in preparation for implementation of expected USP <800> standards.

Conclusion: The process used to bring a new, USP <797> compliant room online required new processes, training, environmental cleaning products, and policies, protocols, and procedures to take full advantage of a modern clean room. This state-of-the-art clean room allowed the return of previously outsourced products and is expected to reduce the costs of production over the long-term.

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Board#-Day
48-M

Category: Quality Assurance / Medication Safety

Title: Liposomal bupivacaine in the operating rooms: Implementing a high risk medication in a high risk environment

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Purpose: Frequently, pharmacy has minimal oversight of surgical areas; therefore, it is imperative to have policies and procedures in place for high risk medications. Liposomal bupivacaine (Exparel) was recently approved as a long-acting local anesthetic administered directly into the surgical site. Due to the liposomal formulation of bupivacaine, medication is released over a period of time resulting in analgesia for up to 72 hours. While it may have significant clinical benefits and improved patient satisfaction, liposomal bupivacaine's unique pharmacodynamic and pharmacokinetic properties also pose safety concerns. This project was designed to address these safety challenges and proactively implement a variety of safety mechanisms into medication use processes.

Methods: When surgeons initially requested liposomal bupivacaine for use in the OR at a multi-specialty academic hospital, both pharmacy and anesthesia had concerns regarding safety. Risks were assessed by the hospital's medication use safety committee and the anesthesia practice optimization group. Efforts were spearheaded by the OR satellite pharmacist and the medication safety pharmacist. Both committees evaluating risks utilized a multidisciplinary team approach and were comprised of various healthcare professionals including nursing, pharmacy, pharmacy informatics, anesthesia, and surgery. Three major safety concerns were identified: 1) similar milky appearance as propofol; 2) accidental interchange with other bupivacaine formulations; and 3) potential toxicity when other local anesthetics are administered within 96 hours of liposomal bupivacaine administration. Based on these concerns, a failure mode and effects analysis was conducted to address possible error prevention strategies in every stage of the medication use process. Once the committees formalized their recommendations, implementation was conducted in a step-wise fashion based on ability to prevent harm and ease of introduction.

Results: Safety barriers were added to the storage, prescribing, dispensing, and administration of liposomal bupivacaine. The medication is included in the institution's Look-Alike Sound-Alike (LASA) list. Liposomal bupivacaine is only kept within and dispensed out of the central and OR satellite pharmacies. To simplify prescribing and dosing accuracy, a specific order for liposomal bupivacaine is built in the computer physician order entry system to include dose, route, and

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administration privilege. A hard stop rule is built in the system so that no additional local anesthetics can be prescribed within 96 hours of liposomal bupivacaine administration. Liposomal bupivacaine requires pharmacist review of the order and product. Additionally, Bar Code technology within central pharmacy helps to further minimize dispensing errors. To prevent inadvertent intravenous administration, pharmacy staff affixes a bright pink Not for IV Use auxiliary label on the medication bag. An Exparel wrist band is dispensed from pharmacy with the medication. A nurse places the wrist band after the surgeon administers liposomal bupivacaine. The hand-off form from surgical areas has a place to denote if liposomal bupivacaine was given during the procedure. Once patient is transferred to a surgical floor, a sign is placed above the patient's bed indicating that liposomal bupivacaine was administered. For any other local anesthetics stored in the automated dispensing system, a pop-up alert is triggered asking if patient has received liposomal bupivacaine within the last 96 hours. Education material was distributed to all nursing staff in both in- and out-patient areas. An in-service was given to surgical, pre-op and PACU nurses by the OR satellite pharmacist.

Conclusion: Liposomal bupivacaine (Exparel) has unique properties that may be valuable in management of post-surgical pain; however, there is high potential for patient harm if it is misused. Through a multidisciplinary team approach, the risks of using liposomal bupivacaine were addressed. A variety of safety mechanisms to prevent harm were engineered and implemented. This project exemplifies the process of safely introducing a high risk medication into a high risk environment such as the operating rooms.

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Board#-Day
49-M

Category: Quality Assurance / Medication Safety

Title: Improving safety for intravenous potassium preparation in the pharmacy

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Purpose: The avoidance of errors in the processing of pediatric and neonatal potassium small volume parenteral orders is an important component in the pharmacy's medication-use safety initiatives. Potassium phosphate and potassium acetate injection are only available as concentrated products and provide an opportunity for preparation errors that can cause significant patient harm or death. This project standardizes the preparation of these solutions and is designed to eliminate manual dilutions of all forms of intravenous potassium for small volume parenteral solutions.

Methods: Potassium for injection must be diluted prior to administration. Utilizing our current potassium chloride preparation practice, the cleanroom manager worked with our drug information resident to assess what would be needed to incorporate safety practices for the phosphate and acetate salts. While there are commercially available diluted products for potassium chloride, such as 10 mEq in Dextrose 5% 50mL, there are no diluted products for phosphate or acetate. The pediatric clinical pharmacists were contacted for the project to validate proposed standard concentrations for both potassium phosphate and potassium acetate for peripheral and central line administration. The standard concentrations for all injectable potassium products were then incorporated into the pharmacy compounding system as templates. The templates were locked to prevent errors associated with data entry. The templates allow for dose preparation using the pharmacy compounding system, eliminating the need for technician handling of concentrated injectable potassium. Subsequent manipulation is only needed for doses with a volume less than 50mL. Such doses are prepared in syringes drawn to the appropriate dose volume from the diluted solution. Additionally, pharmacist order verification documentation materials were updated to include a check for potassium phosphate and acetate doses and administration line type information.

Results: Standard concentrations were established for pediatric and neonatal intravenous potassium replacement. A commercially available diluted potassium chloride product plus templates within the automated compounding machine are utilized to define each potassium solution for injection for central and peripheral infusion sites. All cleanroom externs and technicians, including midnight shift technicians, were given in-service training detailing the

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new intravenous potassium preparation procedure. Each person demonstrated the ability to select the appropriate template and volume to be compounded based on sample labels of patient-specific doses. Pharmacy audit materials for intravenous potassium preparations were updated and audits are regularly conducted for compliance with documentation of appropriate doses and standard concentration for the patients line type. No problems with the utilization of templates in the pharmacy compounding system have been reported, and the process updates have required no subsequent modifications.

Conclusion: Concentrated injectable potassium products are high-risk medications. Standardization of the preparation of potassium injection for small volume parenteral administration has eliminated an important source of human error. Creating standard concentrations and utilizing templates in the automated pharmacy compounding system can help to ensure correct preparation of high-risk electrolyte solutions, and reduce the need for manual dilutions.

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Board#-Day
50-M

Category: Quality Assurance / Medication Safety

Title: Pharmacist-Led Medication Reconciliation for Hospital to Skilled Nursing Facility Transitions of Care: A Pilot Program

Primary Author: Michelle Hughes; **Email:** mitchy07@gmail.com

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Purpose: Skilled nursing facilities (SNF) are a common post-acute care transition point for older adults. Multiple changes to medication regimens during the hospital stay combined with polypharmacy increases the risk for medication errors during transitions of care. The 2015 Long-Term Care National Patient Safety Goals (NPSG) outline standards to improve patient safety including optimizing medication reconciliation (NPSG 03.06.01). Furthermore, Medicare has proposed a SNF Value-Based Purchasing program for implementation in 2018 in order to reduce health care spend. The present study aims to describe the medication-related problems that arise in transitions of care from a community health-system and its affiliated skilled nursing facility for quality and process improvement.

Methods: A post-graduate year two pharmacy resident piloted a medication reconciliation clinical service for a skilled nursing facility from July 30, 2014 to December 31, 2014. The resident spent approximately 2 hours per day on weekdays performing medication reconciliation for newly admitted patients to the skilled nursing facility. The resident also participated in interdisciplinary rounds 3 times a week. Medication-related problems were identified on the skilled nursing admission orders. In addition, the current transitions of care process was mapped from hospital to the skilled nursing facility to identify potential opportunities for improvement.

Results: The resident completed admission medication reconciliation review for approximately 94 percent of patients who were admitted to the skilled nursing facility. On average, time spent per admission was 30 minutes. There were 222 medication-related problems identified with at least 1 medication related problem in 40% of the patients admitted to the SNF. The most common problems included unnecessary continuation of inpatient medications and hospital formulary substitutions. Of note, the current paper-based reconciliation process and varying practices for generating SNF admission orders were identified as contributing factors to the medication-related problems on SNF admission orders.

Conclusion: Hospital to skilled nursing transitions of care is a source of medication-related errors. Standardization and optimization of the current transitions of care process is needed to

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improve quality and patient safety. Currently, clinical pharmacy services are outsourced in our health-system and are limited to a monthly medication regimen review by a consultant pharmacist. Implementation of a medication reconciliation pharmacy service for the skilled nursing facility can help to identify medication-related problems for pharmacist intervention to improve therapeutic outcomes.

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51-M

Category: Quality Assurance / Medication Safety

Title: Implementation of an electronic pharmacy compliance manager tool for controlled substance monitoring (RxCM)

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Purpose: Prescription drug abuse within the United States was estimated to have a 55.7 billion dollar-a-year price tag in 2007. Diversion of controlled substances from within health care facilities has not been well reported, but recommendations for prevention of diversion have been published. As an example, the DEA reported theft of methadone and OxyContin tablets from 2001-2003 to be due to employee pilferage in 23 - 28% of the cases. Intermountain Healthcare (Intermountain) operates 22 inpatient hospital pharmacies, 25 community pharmacies, as well as a supply chain center pharmacy, homecare, and specialty services pharmacy. In 2013, Intermountain conducted a controlled substance audit of its pharmacies to determine compliance with Intermountain requirements for controlled substance inventory, ordering, receiving, tracking, disposal, and oversight. Findings from the audit demonstrated managing compliance was problematic with current processes with respect to documentation and monitoring of timely task completion. Also, it was discovered that there were variations in documentation, which created verification issues system wide. It was concluded that in response, the Internal Process Control team (IPC) would evaluate quality assurance procedures and create an electronic tool to document and monitor required controlled substance activities at Intermountain pharmacies.

Methods: IPC reviewed all internal controlled substance policies and procedures, edited and revised them, and developed a controlled substance monitoring document for activities routinely performed. From this document, IPC created a web based tool for standardization and compliance at Intermountain. This tool allowed for: 1) creation and assignment of regular required tasks for monitoring controlled substances identified from Federal, State, and Intermountain policy; 2) real-time corporate system control and review of all tasks; 3) a standardized system for storing, tracking, and review of documentation and compliance. Programmed tasks are created at a system or local level. Pharmacy staff assigned specific tasks are able to access these tasks from an electronic clipboard that populates electronically based on whether the task is a daily, weekly, monthly, quarterly, or annual task. Assigned tasks

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performed are documented by the staff member assigned to, and documents supporting completion are uploaded and filed into the assigned task once completed. Program design included a support tab, with user/administrator guides along with active links to Intermountain policy and procedure. Detailed step by step processes for each assigned task, including links to Utah State Law and DEA websites for successful completion of each task, were included. A report tab was included to allow corporate/site administrators to assess and monitor compliance. An employee feedback tab for staff comments and improvement was also included. Prior to implementation, IPC provided system wide training for all pharmacy locations.

Results: Intermountain is now able to monitor, accurately and completely, compliance to regulatory and organizational requirements for controlled substances. The RxCM program enables assessing compliance, identifying target areas for re-education or training to improve compliance performance, and provides evaluation tools for personnel performance. Reports resulting from RxCM implementation include a system-wide compliance report identifying overall task completions, an individual site compliance/non-compliance report targeting sites for improvement, a compliance by task report which identifies tasks that need to be evaluated for adjustment and improvement, and an individual user compliance report which identifies individual employee compliance for personal evaluations.

Conclusion: The Pharmacy Compliance Manager Tool (RxCM) provides a useful and real-time process for effectively monitoring required controlled substance activities. Intermountain Healthcare Pharmacy Services believes the use of an electronic tracking method in performing controlled substances monitoring activities provides organizations the most accurate and best practice model for compliance with Federal, State, and organizational laws, policies, and procedures regarding controlled substance monitoring.

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Board#-Day
52-M

Category: Small and Rural Pharmacy Practice

Title: Pharmacist involvement with an outpatient infusion center in a small rural hospital

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Purpose: To describe pharmacist involvement in an outpatient infusion center.

Methods: The pharmacists at MJMH determine initial dosages for IV antibiotics such as vancomycin, gentamicin, and daptomycin. It was during implementation meetings that a pharmacy offer to kinetically dose and monitor patient therapy was accepted by the infusion company representative along with medical staff approval. Therefore, pharmacists now monitor and adjust dosages according to response and patient tolerance. The medical staff allows the pharmacists to order labs such as creatinine values, electrolyte levels, peak and trough levels, and other labs needed to review drug therapy in the infusion center (IC) just as they do on inpatients. Calcium levels are provided for patients receiving denosumab and zoledronic acid and estimated creatinine clearance values (ecrcls) for patients receiving zoledronic acid. Floor stock lists were tailored to meet anticipated utilization as well. The infusion company obtains physician orders for the medications administered in the IC and sends these to the pharmacy and IC. They also register the patients, bill for the services provided, provide a daily infusion schedule, and provide needed lab values. Pharmacy personnel prepare and deliver the IV admixtures prior to the scheduled time and maintain a floor stock of items such as IV catheters and saline flushes. The ability to order many expensive drugs such as denosumab and zoledronic acid on 340B at reduced prices makes the process financially feasible.

Results: From May 2014 through November 2014, the pharmacy provided 122 doses of vancomycin, 21 doses of gentamicin, 28 doses of daptomycin, 64 doses of ertapenem, 45 doses of denosumab, 13 doses of zoledronic acid, and 6 doses of omalizumab. There were 10 vancomycin patients, 3 gentamicin patients, 3 daptomycin patients, 7 ertapenem patients, 45 denosumab patients, 13 zoledronic acid patients, and 1 omalizumab patient. The pharmacist was able to change therapy from daptomycin to vancomycin in 1 patient, which saved approximately \$ 4000.00 Also, the pharmacist was consulted to recommend once daily IV antibiotic therapy based on a culture and sensitivity report. Savings from these 340 B purchases amounted to \$ 41,718.00. Each therapy was managed and monitored by a pharmacist.

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Conclusion: Expertise provided by the pharmacists helped provide safe and effective therapy. Utilizing 340 B purchasing power made the delivery of this service cost effective. An efficient delivery system also streamlined the process which increased nurse and patient satisfaction.

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Board#-Day
2-T

Category: Administrative practice / Financial Management / Human Resources

Title: Development of pharmacy department productivity metric encompassing both distributive and clinical responsibilities

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Purpose: Salem Hospital historically used an operational metric of the number of orders processed as its unit of service (UOS) statistic in order to measure departmental productivity and determine staffing requirements. Gradually, with increased pharmacy involvement in clinical activities, this metric has become less reflective of pharmacist workload. This project was designed to estimate the time spent on clinical pharmacy activities and develop a productivity metric which accounted for both distributive and clinical responsibilities.

Methods: Pharmacists covering internal medicine, intensive care, and hematology/oncology units were observed by final year student pharmacists who recorded time spent on various activities. Information was then used to develop and implement a standardized process for documenting high-yield pharmacist interventions. This included pharmacist monitored medications (e.g., vancomycin/aminoglycosides, warfarin), medication allergies, Code Blue response, and intravenous to oral substitutions. Data representing this clinical activity was then combined with distribution data to develop a new productivity measure. The final productivity measure included (1) number of doses administered divided by 100, (2) number of medications sold through the affiliated outpatient pharmacy divided by 100, and (3) number of documented pharmacy patient care interventions.

Results: Students captured approximately 92.6% of each pharmacist's shift. Time spent on clinical activity was as follows: internal medicine, 52%; intensive care, 77%; and hematology/oncology, 49%. Over a three month interval, pharmacists documented 3605 154 interventions monthly. These interventions were then integrated into the new productivity measure. The new combined UOS and expense per UOS appears to be more consistent when making historical comparisons thus allowing for implementation of the new metric for budget forecasting.

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Conclusion: Results of this project allowed for implementation of a department productivity measure which accounted for both distributive and clinical pharmacist responsibilities. The new metric provides a method for measuring workload associated with pharmacist engagement in current and future clinical initiatives. Future steps of this project will be focused on back testing the metric against historical data, standardizing data entry into the intervention documentation platform, and further refinement of the metric. Future research should be conducted to determine if this metric is applicable to other hospitals.

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Professional Poster Abstract

Board#-Day
3-T

Category: Administrative practice / Financial Management / Human Resources

Title: Estimating the value of clinical pharmacy activities in a community hospital

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Purpose: Economic justification is often needed to support the implementation and continuation of clinical pharmacy services. The purpose of this project was to estimate the value for a select number of high-yield clinical pharmacy activities in a community hospital.

Methods: A literature search was performed to determine existing clinical pharmacy activities at Salem Hospital where a value, in terms of cost avoidance, had been reported. Four pharmacist managed medications were identified (cost avoidance): vancomycin/aminoglycosides (\$1,518), heparin infusions (\$1,145), warfarin (\$370), and anti-epileptic medications (\$115). Existing workflows were then evaluated to administratively determine the number of medications in these areas managed by pharmacists.

Results: Data were collected from January 1 - December 31, 2014 for vancomycin and aminoglycosides, April 1 December 31, 2014 for anti-epileptics, and September 1 December 31, 2014 for anticoagulation infusions and warfarin. Pharmacists managed an average of 284, 13, 186, and 184 patients per month for vancomycin/aminoglycosides, anti-epileptics, anticoagulation infusions, and warfarin, respectively. Extrapolating to a 12 month interval, this translated to an estimated cost avoidance of \$8.6 million annually (vancomycin/aminoglycosides: \$5.2 million; anti-epileptics: \$18,000; anticoagulation drips: \$2.6 million; warfarin: \$817,000).

Conclusion: Results demonstrate that clinical pharmacist activity resulted in significant cost avoidance to the hospital. Data were used to illustrate the hospitals finance department the importance of clinical pharmacy activity and the need to incorporate clinical pharmacy workload into the departments productivity metric for budget forecasting purposes.

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Board#-Day
4-T

Category: Administrative practice / Financial Management / Human Resources

Title: Pharmacy technician continuing education: An evaluation of job-relevance and satisfaction with current offerings

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Purpose: The Ohio State University James Cancer Hospital (The James) requires all pharmacy technicians to be certified by the Pharmacy Technician Certification Board (PTCB) within 6 months of hire. PTCB requires that technicians complete a minimum of twenty hours of continuing education (C.E.) during each two-year recertification cycle. Additional requirements include one hour in the subject of pharmacy law and one hour in the subject of patient safety. The James does not currently offer technician C.E. The opening of the new James 348-bed cancer and critical care tower in December 2014 required recruitment, hiring, and training of approximately 27 technician FTEs for the inpatient pharmacy. Because of the varied backgrounds amongst the new technician hires, members of the pharmacy leadership team sought to develop didactic training programs on topics relevant to health-system pharmacy. Discussions with current technicians revealed that available, external C.E. offerings were not applicable to the daily work of the hospital pharmacy technician. The authors aimed to 1) determine satisfaction with current C.E.; 2) identify curricular topics that would be of interest to, and improve applicable knowledge of health-system pharmacy technician practice, and 3) develop a program that would allow pharmacy technicians at The James to meet PTCB C.E. requirements while obtaining relevant job-specific training. At the time of the study, The James employed fifty-six pharmacy technicians (40 technician FTE) in the inpatient pharmacy.

Methods: An eight-question survey was developed and sent via email to all inpatient pharmacy technicians employed at The James. Questionnaire responses were rated using a 5-point likert scale. Questions intended to assess: technician satisfaction with current C.E., level of interest in a listing of various health-system pharmacy topics, preferred method of C.E. delivery (recorded online presentation vs. live presentation), and technician demographics.

Results: Twenty-four technicians responded to the survey (43% response rate). Of the respondents, seventeen were currently certified and seven technicians were not certified (they were still within the six-month grace period from hire date). Of currently certified technicians, the level of satisfaction with current CE offerings was 3.6. Respondents ranked the following 3 topic areas the highest of 8 potential topics: patient safety (4.6), pharmacology (4.5), and

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pharmacy law (4.5). Seventy-seven % of respondents preferred the online video method of C.E. delivery (17/22). Given a multiple select question, over 45% of respondents (14/31) indicated they currently obtained C.E. via Power-Pak CE, and 19% (6/31) obtained C.E. via the National Pharmacy Technician Association. Length of employment varied amongst survey respondents: Less than 6 months (13%); 6 months to 1 year (8%); 1 to 2 years (13%); and greater than 3 years (29%).

Conclusion: Pharmacy technician continuing education is required to maintain PTCB certification and employment at The James. This survey revealed that technicians are not highly satisfied with current C.E. offerings. From the free-text responses of the survey, several technicians indicated that that current C.E. may not be particularly relevant to the technician role in health-system pharmacies. Topics of interest to pharmacy technicians were identified, and a relevant, job-specific C.E. program is now in development at The James.

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5-T

Category: Administrative practice / Financial Management / Human Resources

Title: Case mix index as a marker for monitoring pharmaceutical costs and utilization at a rehabilitation hospital

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Purpose: Hospital finance departments routinely monitor their case-mix index; utilizing it as a tool to interpret monthly budget variances, in addition to forecasting future budgets. A hospital's case-mix index is determined by the sum of all Diagnosis Related Group weights for all Medicare discharges, divided by the number of patient discharges. Therefore the higher the composition of a hospital's case-mix index, the more reimbursement the hospital is eligible for. Sustained unexpected higher case-mix indices could potentially negatively impact the pharmacy budget. Corpus Christi Rehabilitation Hospital, is a new hospital approximately 30 months old, with 35 beds. Beginning August of 2013, case-mix index was included as a factor in monitoring drug utilization at Corpus Christi Rehabilitation Hospital. Despite rising census, and case-mix index, costs of pharmaceuticals remarkably decreased, based on routine financial and clinical monitoring, by the pharmacy department.

Methods: The period of the study was from August 2013, through December 2014. The pharmacy department obtained case-mix index from the financial department on a daily basis, as well as the monthly average. The pharmacy department also collected data which included number of patient days for the month, number of drug doses dispensed, as well as costs of drug utilization for those patient days, during that period. Drug cost per patient per day was calculated, as well as cost per dose of drug dispensed, monthly.

Results: The number of patient hospital days for the study period was 9552, with 210,732 doses dispensed, at a cost of 215,472 dollars. Case-mix index ranged from 1.04 to 1.51, with a mean of 1.33, and standard deviation of plus or minus 0.13. The mean monthly patient hospital days was 561.8 with a standard deviation of plus or minus 95.6, minimum of 333, and maximum of 689 days. Mean monthly number of doses dispensed was 12,396, with a standard deviation of plus or minus 1989.7, minimum of 9,193, and maximum of 16,192 doses. The mean monthly drug utilization cost was 12,674.82 dollars with a standard deviation of plus or minus 4,263.19, minimum of 4,142, and maximum of 22,637 dollars. Drug cost per patient day ranged from 6.29

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to 32.85, mean of 22.67, with standard deviation of plus or minus 6.14 dollars. Cost per dose of drug dispensed ranged from 0.3 to 1.53, mean of 1.02 with standard deviation of plus or minus 0.28 dollars. Over 17 months, while monthly patient days ranged from 484 to 689, and case-mix index rose from 1.2 to 1.5, the cost per dose of drug dispensed fell from 1.18 to 1.10 dollars.

Conclusion: Case-mix index, in addition to appropriate drug utilization and monitoring can be used to enhance financial outcomes in healthcare institutions. Case-mix index was used at Corpus Christi Rehabilitation Hospital, in addition to other parameters, to monitor, manage and reduce pharmaceutical costs. Further work in this area is warranted to determine the impact of using case-mix index in modulating pharmaceutical costs in hospitals.

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Professional Poster Abstract

Board#-Day
6-T

Category: Ambulatory Care

Title: Does a community pharmacists intervention post-hospital discharge have an impact on 30 or 90 day smoking cessation rates?

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Purpose: Tobacco use is the single largest preventable cause of death in the United States. While many smokers are interested in quitting, they may have barriers to receiving assistance. Hospitalization and discharge provides a great opportunity to make smoking cessation interventions, as many patients who smoke may be contemplating a change. The purpose of this program will be to determine if collaborative care initiated prior to hospital discharge, followed by a referral to a state based Quit Line and a community pharmacy smoking cessation program, for up to 90 days, has an impact on smoking cessation.

Methods: A pilot smoking cessation service is being implemented by a care team in the hospital, working collaboratively with community pharmacy residents. Adult patients in the rehabilitation unit of the hospital are included. During a patients hospital stay, a social worker, pharmacist and provider work together to engage the patient in a brief behavioral intervention, followed by Colorado Quitline enrollment and creation of a smoking cessation plan, that includes providing smoking cessation medication at discharge. Follow up calls are made by a community pharmacy resident to the patient at approximately 7 days, 30 days and 90 days post-discharge. Calls are made by the community pharmacy residents at their community pharmacy practice sites and are integrated into the workflow of the pharmacy. During these calls, sustained abstinence, medication efficacy, tolerability, medication related problems and Quitline utilization are assessed. Data is collected during follow up calls, and the primary outcome is smoking cessation rates at 7 days, 30 days, and 90 days. The evaluation of this pilot service will not have a comparator group; therefore, all data will be descriptive in nature.

Results: Between November 13, 2014 and March 13, 2015, thirteen participants were enrolled in the study. Of the 13 participants, seven day follow up calls have been completed for 6 participants, 30 day follow up calls have been completed for 3 participants, and 90 day follow up calls have been completed for 1 participant. Four of the six participants were still abstinent from smoking (67%) at seven days, 2 participants (67%) were abstinent at 30 days, and the 1

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participant was still abstinent at 90 days post-discharge. Five participants (83%) had not utilized state Quitline resources at 7 days. At the 30 day follow up, 1 participant had not utilized the Quitline resources. There were no medication related side effects reported at the 7 day follow up, but there was one report of side effects at 30 days, that caused a change in medication. This is an ongoing service being piloted and data collection is still underway. At this point, there are few participants in the study; this number will continue to grow as the study continues. Due to the small study population, there is no comparator group, and all data analysis is descriptive in nature.

Conclusion: The preliminary results indicate that the majority of rehabilitation unit patients that showed interest in quitting smoking, stayed abstinent for up to 90 days. There was a high rate of participants lost to follow up, and of participants not using state Quitline resources. This study provides important information regarding the utilization of community pharmacists in an interprofessional setting to increase success rates of tobacco cessation post-hospital discharge. Further investigation is needed to confirm the findings of this study.

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Board#-Day
7-T

Category: Ambulatory Care

Title: Implementation of a pharmacist-led smoking cessation clinic in an internal medicine practice

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D. Michael Elnicki

Purpose: Tobacco use is the leading preventable cause of morbidity and mortality in the United States. Regardless of the well-documented negative health impact, millions of adults persist with smoking cigarettes. Individuals who are interested in quitting will likely require multiple quit attempts before successfully obtaining complete cessation. Combining behavioral counseling with medication therapy is the most effective treatment option to improve smoking cessation success. However, utilization of these interventions remains low. A pharmacist working within a primary care practice provides a unique opportunity to offer services to patients. The purpose of this project is to implement a pharmacist-led smoking cessation counseling clinic within an academic, hospital-based internal medicine practice.

Methods: We conducted a prospective cohort study to assess the impact of a pharmacist-led smoking cessation counseling clinic within an internal medicine practice. Physicians referred patients who were active smokers and interested in quitting. Initial appointments included assessment of patients smoking history, current smoking status, and triggers for cigarette cravings. Behavioral changes and medication options were also discussed. Each additional follow-up appointment focused on relapse prevention and motivation, adjusting patient specific goals and management plans as needed. Participating patients were compared to two separate control groups: patients who were referred but never completed appointments (RNCA) and patients that were never referred (NR). NR patients were matched to enrolled patient cases based on gender, age, and race. Smoking cessation status was analyzed 3 months after baseline enrollment date to determine quit rates. Data were collected from the electronic health record and quarterly quality reports. An intent-to-treat model was followed. The following were analyzed: patient self-reported cigarette use, breath carbon monoxide level, blood pressure, pulse, weight, and smoking cessation medication. The institutional review board approved the study design, and patients provided informed consent prior to enrollment.

Results: Twenty-two patients participated in smoking cessation counseling offered by the pharmacist, and 20 were enrolled for at least 3 months. Patients were an average of 52 years old and were predominantly female (64%) with 50% of the group being African-American. The baseline carbon monoxide level was 3.2% carboxyhemoglobin (COHb) with a range of 1.1-6.2%

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COHb. Forty-five percent of patients participated in more than one counseling session. Smoking status was verified utilizing the electronic health record within 4 months of the targeted date. No enrolled patients completed a 3-month pharmacist assessment. The last known smoking status was used for 7 patients with an unverifiable smoking status. Enrolled patients were compared to 52 RNCA patients and 22 NR patients. RNCA patients were an average of 50 years old and the majority was female (56%) and African-American (69%). Patients who participated in pharmacist counseling had a 35% documented quit rate compared to 4% for RNCA patients (chi-square 14, p less than 0.05) and 0% for NR patients (chi-square 44, p less than 0.05).

Conclusion: An increased rate of smoking cessation was obtained with patients enrolled in pharmacist-led counseling. The number of patients who participated in multiple counseling sessions decreased over time, indicating non-compliance with long-term counseling. The inability to verify smoking status with carbon monoxide levels limits the results. However, these results support the potential improvement in smoking quit rates when a pharmacist provides smoking cessation counseling to patients within an internal medicine practice.

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Board#-Day
8-T

Category: Ambulatory Care

Title: Pharmacy based disease state management: A hypertension management model at an ambulatory Care pharmacy

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Additional Author (s):

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Purpose: To describe a model of hypertension disease state management at an ambulatory care pharmacy and present preliminary data. The profession of pharmacy is evolving from a product focused practice to a patient-centered service. Patient centered care involves disease state management for most chronic disease states such as hypertension. Incorporating such disease state management programs into the pharmacy point of care is part of this evolution. An important component of this disease state management, is the delivery of evidence based targeted interventions at key points of patient care. Pharmacy visits for medication pick up present an opportune point in the patient care process to provide these interventions, this poster attempts to describe a model that can be used to deliver this service.

Methods: A service model was created to deliver hypertension disease state management at an ambulatory care pharmacy. The model includes 1. Pre-screening for eligibility 2. Protocol 3. Patient engagement and enrollment 4. Patient-Pharmacist initial visit 5. Patient-Pharmacist subsequent visit. 6. Documentation.

Results: A patient care model was created to deliver hypertension disease state management at an ambulatory care pharmacy. The model includes 1. Pre-screening for eligibility 2. Protocol 3. Patient engagement and enrollment 4. Patient-Pharmacist initial visit 5. Patient-Pharmacist subsequent visit. 6. Documentation. Results: A pharmacy based coordinated care program was identified as a target patient group. Patients were screened for eligibility. Patients were eligible if they were on at least one pressure blood pressure medication. Ten patients were identified through targeted screening from the pharmacy based coordinated care program. Eight patients were enrolled. Two patients stated issue with ambulation as reason for declining. Seven patients were not at blood pressure (BP) goal at initial reading. To date 59 Patient-Pharmacist visits and blood pressure readings are documented. Interventions were based on protocol. Average time for initial visit was 30 minutes and subsequent visit was 20 minutes. To date seven patients are at or close to blood pressure goal by average. Periodic Medication

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possession ratios were assessed retrospectively and showed average of 0.98 for year 2013 and 0.94 for year 2014.

Conclusion: The ambulatory pharmacy based hypertension disease state management model was successfully piloted in an ambulatory care pharmacy with a limited targeted group of patients. The model proved to be conducive to integration with routine work flow. An increase in positive engagement with pharmacists and patients was observed. A slight initial positive trend towards goal blood pressure average was observed. The group was too small to draw definitive correlation and conclusion but the model was amenable to incorporation within pharmacist routine counseling visit with patients at medication pick up and targeted intervention based on established protocol and shows potential for positive outcomes.

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Professional Poster Abstract

Board#-Day
9-T

Category: Ambulatory Care

Title: Promoting herd influenza immunity in a university setting through pharmacy administered vaccines covered by the student health benefit plan

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Purpose: Herd influenza immunity in university settings is vital for protecting against the rapid spread of infection across areas such as close group living quarters, educational activities and social events. The University of Illinois Hospital and Health Sciences Systems (UI Health) Ambulatory Care Pharmacy department has offered point-of-service immunizations since 2006. Historically, annual pharmacy-based student influenza immunization rates were low, primarily due to inconvenient access (i.e. lack of vaccine coverage at the pharmacy, scheduling appointments to receive vaccination with primary care provider). In order to promote herd influenza immunity and expand student access to the vaccine, a comprehensive, pharmacy-based, vaccination program was implemented which resulted in increased student influenza immunizations rates in this setting.

Methods: The UI Health Ambulatory Pharmacy Department partners with the university student health benefit plan to provide pharmaceutical care benefits. As an extension of this collaboration, two on-campus pharmacies became influenza immunization providers under a contractual agreement at the start of the 2013 academic year. The pharmacies administered and billed for influenza immunizations for the members covered under this health plan. Student outreach initiatives were implemented to facilitate easy access and increase immunization rates. On an annual basis, the process includes the following elements: 1.Preparation and staff training 2.Policies and procedures, prescription and protocol review 3. Pricing, billing and payment establishment 4.Promotion and outreach 5.Patient triage 6.Prescription processing and vaccine administration 7.Processing documentation 8.Post-season review.

Results: The implementation of this student focused immunization service resulted in over an eight-fold increase of student flu shots compared to the previous years flu season. A review of the prescription and payment data for the year prior to becoming influenza vaccine providers (2012-2013), show that only 104 student immunizations were administered across the two pharmacies. Subsequent to the approved coverage, a total of 1004 immunizations were

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administered the following season (2013-2014). These immunizations were completed at the two in-network student pharmacies (761 vaccinations) and during an influenza outreach health fair (243 vaccinations). Furthermore, this 2014-2015 influenza season (on going), we have administered 784 flu vaccines. Through standardized policy and procedures and an established pricing and billing mechanism, this vaccine program was successfully incorporated into the workflow of the two pharmacies.

Conclusion: This partnership between UI Health Pharmacy and the UIC student health benefit plan, enhanced student access to influenza immunizations, increased vaccination rates and contributed towards herd immunity in this population. To further impact student influenza vaccination rates at the University of Illinois at Chicago, we must continue to evaluate effective methods to expand influenza awareness on campus through education, promote immunization advocacy and design and implement new marketing strategies to support pharmacy-based influenza immunization services.

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Professional Poster Abstract

Board#-Day
10-T

Category: Ambulatory Care

Title: Referrals in a pharmacist-managed transition of care clinic

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Purpose: Changes in medications and follow up appointments after a hospital stay can lead to confusion and be challenging for patients. Once a patient leaves the hospital, follow up appointments are crucial in the continuity of care post-discharge. In addition to optimization of medications, pharmacists are placed in a unique position to impact facilitation and recommendation of referrals to the appropriate service tailored to the needs of the patient and their respective disease states. The purpose of this project was to assess the average number of referrals, and the most frequent referral type per patient in a newly implemented pharmacist-managed Transition of Care Clinic in order to identify the needs of this patient population.

Methods: Adult patients were screened for inclusion based on discharge information including geographic location, insurance coverage, and disease state, as well as outpatient referral. Those that were identified as eligible were enrolled into the Transition of Care Clinic managed by pharmacists. A retrospective chart review of patients enrolled in the Transition of Care Clinic was performed to assess the number of referrals per patient, whether they were initiated by the pharmacists of the Transition of Care Clinic or just facilitated, as well as the most frequent type of referral overall. Initiated referrals were defined as referrals prompted by the pharmacist based on needs of patients presented during Clinic visits. Facilitated referrals were those that the provider had recommended post-discharge from the hospital and the pharmacist assisted the patient in follow up after a Transition of Care Clinic visit.

Results: Twenty patients charts were evaluated and included in this assessment. Overall there were 37 referrals made by the Transition of Care Clinic. These included referral to cardiac rehabilitation, outpatient pharmacy, pulmonary rehabilitation, diabetes education, stroke rehabilitation, physical and occupational therapy, primary care physician, and/or a specialist. These referrals resulted in an average number of 2 referrals per patient. Transition of Care Clinic initiated 70% of the total referrals and helped to facilitate 30% of overall referrals. The most frequent type of referral was to primary care physician.

Conclusion: Referral services are an integral part of post-discharge planning. Aligning resources for patients is vital to ensure the continuity of care once the patient leaves the hospital. For patients at the Transition of Care Clinic, the most utilized referral was directing a patient to a primary care physician which may have included resolving a medication related issue or establishing care. Primary care referral was most commonly initiated by the pharmacists at the Transition of Care Clinic, and it is apparent that establishing follow up with a primary care

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physician is the greatest need post-discharge for these patients. This pharmacist-managed Transition of Care Clinic was in a key position to meet the needs of patients post-discharge. This may be attributed to pharmacists ultimately ensuring that patients are following up with appropriate resources available to them, thus ameliorating potential loss to follow up.

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Board#-Day
11-T

Category: Ambulatory Care

Title: Development of a Trigger Tool to Identify Pharmacist Impact in Transitions of Care

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Purpose: Ambulatory care clinical pharmacists can play a key role in the transitions of care (TOC) by optimizing therapy, conducting medication reconciliation, and establishing continuity between health care providers. Tools are available in the literature for multidisciplinary evaluation to identify patients at high risk for a hospital readmission; however, the tools and standard processes are not specific to a pharmacist's role in the outpatient setting. A pharmacist's intervention during the TOC can be critical but requires a strategy to stratify patients that may have the greatest benefit from pharmacist review and follow-up post-hospitalization. The purpose of this study was to determine which patient factors are associated with a high rate of pharmacist intervention through the use of a pharmacy focused trigger tool.

Methods: The institutional review board approved this retrospective quality improvement project. The trigger tool is a set of 12 questions and was developed by ambulatory care clinical pharmacists. Questions were developed based on various validated questionnaires in the literature focusing on patients at risk for readmission, as well as patients at risk for medication related events. Patients evaluated through use of the trigger tool were initially referred to a remote care nursing program targeted to identify patients at high risk for hospital readmission. Nursing staff evaluated all patients referred to their service with use of the trigger tool and subsequently referred all patients to the ambulatory care clinical pharmacy team for medication reconciliation and phone follow up. Data was collected on patients referred between October and December 2014. Patient data collected included age, gender, discharge date, pharmacy contact date, total number of medications, and date of readmission (if within 30 days of discharge). Trigger tool responses and total scores were also collected, along with number and type of interventions made by the pharmacist.

Results: In total, data from 52 patients was evaluated. The average age of the patient population was 62 years and 56% (n = 29) were male. Ten patients (19%) were re-admitted to our institution within 30 days of discharge. Forty five patients (87%) were contacted by a clinical pharmacist via phone and of those, 35 (78%) were contacted within 7 days of discharge. The remaining 10 (22%) patients were contacted within 30 days of discharge. The average number

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of medications per patient was 12. Pharmacists made 145 interventions during the study period with an average 2.8 pharmacist interventions per patient. . Interventions were categorized and the most common interventions were patient discrepancy, medication safety, and therapeutic optimization. Of the 12 questions included on the trigger tool, four were shown to be statistically more likely to result in a pharmacist intervention.

Conclusion: Results from this pilot process and retrospective evaluation indicate that a set of targeted questions may help to identify patients at risk for hospital readmission who would benefit most from a pharmacist evaluation. Next steps include simplification and validation of the pharmacy focused trigger tool for use in a more general patient population.

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Board#-Day
12-T

Category: Automation / Informatics

Title: Implementation of an economical medication ordering management system using scanning technology in a small hospital

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Purpose: It is well established, that outside of CPOE, the scanning of medication orders to pharmacy for pharmacist review is a best practice for patient safety. The challenge for smaller facilities is the cost prohibitive nature of software systems that allow hospitals to embrace this modality of operational excellence. This project was designed to allow our hospital entry into this market without it being cost prohibitive by avoiding the use of turn-key products for medication order management.

Methods: We took an already needed and now complementary step by updating our printer contract that delivered printers capable of server-based network connectivity. Concurrently, our IT (Information Technology) department established dual screen monitors at the order entry stations in the pharmacy. We utilized our current network server and established a hand shake between the new printer and network. From this engagement, via a web portal, we were able to establish destination folders based on unique IP addresses. This routing enabled us to direct our medication orders directly to the pharmacy as unique Adobe Reader files.

Results: In the pharmacy we set up folders that were organized by months and years and upon receipt of the medication orders we renamed the scan with the patients name. Each scan we received had an associated time and date stamp automatically assigned via Adobe Reader. The naming process concomitant with the date and time stamp allowed better sorting, organizing, and searching capabilities. Due to the adoption of scanning technology we were able to have better medication order communication, fewer lost orders, a more timely delivery of medications, fewer med errors, and a reduction of paper consumption. Other departments followed our lead and were able to establish destination folders to better serve their paperless communication needs also; such as patient registration and accounting.

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Conclusion: Our hospital was successful in designing, engaging and implementing a patient safety initiative using medication order management scanning technology in a cost effective modality that can be replicated in any facility with limited resources.

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Board#-Day
13-T

Category: Automation / Informatics

Title: Development of a dynamic, interactive, and customizable sterile compounding quality assurance report at an academic medical center

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Purpose: To meet USP <797> standards and to ensure the highest quality care regarding our sterile product preparation, our organization developed a quality assurance process that is summarized in a monthly report. This report contained information regarding cleaning log compliance and results of microbial sampling of compounding hoods, clean rooms, and ante rooms. The report was valuable, but took considerable effort to manually assemble and did not allow end-users to manipulate the report. Emerging business intelligence technology provided the opportunity to improve our reporting process. This project was designed to leverage this new technology to provide a more robust, flexible, and interactive sterile compounding quality assurance report.

Methods: Starting in October 2012, a monthly report was developed that detailed compliance with USP <797> standards. The report is reviewed by pharmacy leadership and at a multi-disciplinary meeting composed of representatives from hospital epidemiology and infection control, facilities engineering, and environmental services. This report was very labor-intensive, taking between 30-40 hours per month to produce. Additionally, it was produced on paper and, therefore, was static. The pharmacy analyst responsible for producing the report, in consultation with institutional informatics leadership, identified emerging business intelligence technology that could dramatically improve the efficiency of producing the report and the usefulness of the report as a business decision-making tool. The decision was made to convert from a reporting system based on a manual extraction from a standard spreadsheet program to dynamic data visualization dashboards that are automatically fed by SQL Servers.

Results: The previous process of preparing the quality assurance report required manual data entry based on disparate third party reports, manually reviewing end-product testing results of high-risk preparations, and tallying cleaning log compliance for all 10 compounding pharmacy areas within the academic medical center. Nearly every step in the revised process has gained efficiency as a result of this project. While manual data entry is still required, our dynamic data

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visualization software now automates calculations regarding compliance and summarizes them in automated reports. The reports are now able to be produced within one 8 hour workday. Furthermore, these reports are able to be customized and automatically sent to various end-users, who are then able to share these reports. For example, leadership from each of our compounding pharmacies receives reports that are automatically generated and distributed to them and are relevant to their particular pharmacy. Additionally, each of these reports is able to be customized according to the design and content preferences of each group or user. In this way, our new data visualization software allows end users to answer the next round of questions that arise from viewing and understanding the base report.

Conclusion: By leveraging emerging data visualization and data management technology, our department was able to make a standard quality assurance report more efficient, data rich, and interactive.

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14-T

Category: Automation / Informatics

Title: Role of pharmacy informatics in the application of pediatric weight based dosing to support the implementation of computerized provider order entry (CPOE) in an academic pediatric hospital

Primary Author: Marvin Skinner; **Email:** marvin.skinner@christushealth.org

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Purpose: The significant variability in the level of pediatric-specific medication dosing functionality provided in currently available computerized provider order entry (CPOE) applications and the lack of rigorous reports on CPOE pediatric dosing rule development has been recognized in peer review literature. While most CPOE systems allow for an easy medication order entry process in the adult population, they do not; in general, focus on weight based dosing functionality and other medication order entry safeguards which are critical for the accuracy of medication order entry for pediatric patients. To address the unique needs of a pediatric population, pharmacy informatics played a major role in the development of standardized medication dosing standards and clinical decision support including pediatric medication dosing sets, medication strings and order sets.

Methods: Pharmacy Informaticists and pediatric pharmacists from across the CHRISTUS Health system met on a regular schedule to design a standardized pediatric dosing guideline. This guideline focused on an initial list of drugs and set criteria for medication dosing, dosing calculations, min/max doses, dose rounding and age parameters for those drugs. The creation of the guideline along with a pediatric medication dosing policy enabled providers and pharmacists with a defined set of guidelines for medication dose standardization and rounding to consistently create and build pediatric specific clinical content within our electronic health record (EHR). In addition, pharmacy informaticists participated in a focus group led by our EHR vendor on pediatric ordering where they submitted specific system enhancements and provided feedback on proposals for system changes that evolved from the focus groups.

Results: Using the standardized dosing guideline, pharmacy informaticists created over 1800 dosing sets associated with 372 medication profiles. This provides clinicians with over 1800 weight based medication dosing strings and a comprehensive set of over 210 pediatric-specific order sets that covers a variety of care settings and sub-specialty content. On November 4, 2014 the CPOE application was rolled out to the Emergency Department, Neonatal Intensive

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Care Unit, and Oncology/Hematology at Childrens Hospital of San Antonio. By the second day, the hospital achieved greater than 50% of medications, radiology and laboratory orders entered directly by providers. On December 3rd, 2014 the CPOE application was rolled out to the remaining units with the facility and has since consistently achieved greater than 80% of medication, radiology and laboratory orders entered directly by providers. The clinical content along with the functionality enhancements created through our systematic effort over the prior 3 years were well received. Clinicians valued and felt at ease in regard to safety and effectiveness of this pediatric CPOE module.

Conclusion: The unique nature of pediatric clinical care versus adult care warrants the creation of specialized clinical content and clinical decision support within CPOE in order to treat children effectively and safely. Pharmacy Informaticists leveraged the center of pediatric excellence in our large care network to create pediatric-specific medication dosing functionality that is benefitting thousands of pediatric patients. Now clinicians, who may not have pediatric expertise to quickly determine dosage for their youngest patients, will benefit from the enhanced safety and functionality of our CPOE system. The rapid rate of CPOE adoption at the Childrens Hospital reflects endorsement of this application as being accurate and facilitative.

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Board#-Day
15-T

Category: Automation / Informatics

Title: Improving pharmacy data analytic capabilities at an academic medical center

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Purpose: Analytics is a term that is often utilized in business to define the evaluation and comparison of structured data metrics in order to derive conclusions about processes, products, and services. Healthcare data is traditionally built to facilitate the provision of high-quality patient care. Since analytics in healthcare is becoming more prevalent, this project aims to conduct a gap-analysis on data analytic needs for the Department of Pharmacy and therefore designed to identify existing hospital data elements, determine their pertinence to the Department of Pharmacy's patient care and business intelligence needs, and evaluate the analytic needs for key pharmacy stakeholders as a first step to strategically develop the framework towards building a business intelligence infrastructure.

Methods: A second year pharmacy informatics resident evaluated the content of hospital data systems and determined the value of that data to the Department of Pharmacy for clinical and business operations. Other elements that were evaluated included the extent of current access for analytics using database management software, identifying potential barriers to gaining access to data sources, and determining how pertinent systems interfaced with each other. The data systems for assessment were first identified by pharmacy report writers and then cross-checked with corporate hospital information technology analysts. A series of focus group discussions were also conducted with key pharmacy stakeholders including pharmacists and pharmacy administrators to assess the analytic needs for the department.

Results: Sixteen systems were identified including systems related to medication and non-medication orders, automated dispensing cabinets, pharmacy automation, drug product vendor information, and external benchmarking data. Of the systems identified, pharmacy initially had full access to only one system using database management software. Two of the systems were opened to access after request. Two of the systems additionally were identified as needing formal prerequisite procedures by department of pharmacy in order to allow access. Four systems were identified as having partial access but requiring data manipulation to have full access with database management software. One system was identified as not capable of

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getting access. For six systems, a process for gaining analytic access could not be identified. During the needs assessment, staff indicated data related to compliance, financial information, inventory, operations, and patient care were the categories of interest as it relates to increased analytic capabilities.

Conclusion: The pharmacy analytics gap-analysis uncovered new data sources for the Department of Pharmacy. The information about the data sources and the evaluation of staff analytic needs is a crucial starting point towards the eventual goal of developing a clinical and business intelligence architecture for a department of pharmacy at a large academic medical center.

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Board#-Day
16-T

Category: Cardiology / Anticoagulation

Title: Evaluation of a pharmacy managed heparin protocol in extracorporeal membrane oxygenation

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Purpose: Unfractionated heparin has traditionally been considered the anticoagulant of choice for patients on extracorporeal membrane oxygenation (ECMO) given its short half-life and reversibility. Many ECMO centers utilize activated clotting time (ACT) for anticoagulation monitoring, which is typically managed using clinical judgment rather than a protocol. Recent study has shown that utilizing activated partial thromboplastin time (aPTT) to monitor heparin anticoagulation in ECMO patients exhibits a better correlation to heparin dose over ACT. As a result, a pharmacy managed heparin protocol utilizing aPTT for anticoagulation monitoring was implemented for patients on ECMO. The objective of the study is to evaluate the efficacy and safety of a pharmacy managed heparin protocol in ECMO patients.

Methods: All patients on ECMO during the study period initiated on a pharmacy managed heparin protocol were evaluated for study endpoints. Patient demographic and baseline characteristics were retrieved from medical records, using both manual and automated techniques. This data included age, gender, type of ECMO (VA or VV), heparin dose, aPTT values, hemoglobin, hematocrit, hemodynamics, and signs/symptoms of bleeding or clotting. The primary endpoints were time to reach therapeutic aPPT, percentage of time patients remained in therapeutic range, and thrombotic or hemorrhagic complications. Data will be analyzed using descriptive statistics.

Results: Over the twenty month study period, sixty six patients on ECMO were initiated on the pharmacy managed heparin protocol for anticoagulation. The study population consisted of 40 (62 percent) males with an average age of 51 years. Forty nine patients (77 percent) were on venovenous ECMO. The median time spent on ECMO was 9 days. The overall survival rate was 58 percent (38 patients). Preliminary findings suggest a decrease in hemorrhagic complications and transfusion requirements when managed with a pharmacy heparin protocol.

Conclusion: Impact of the implementation of an aPTT based pharmacy managed heparin protocol is currently being evaluated. To date, no literature has been published describing the

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outcomes of managing heparin anticoagulation via a pharmacy managed protocol in ECMO patients. The development of this protocol has the potential to decrease bleeding and thrombotic complications, while providing effective anticoagulation for patients on ECMO.

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Professional Poster Abstract

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17-T

Category: Cardiology / Anticoagulation

Title: Peri hospitalization switching patterns of thienopyridines in patients with acute coronary syndrome

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Purpose: Evidence supports routine use of a thienopyridine after acute coronary syndrome (ACS). Rationale exists (e.g. pharmacokinetic/genomics profile) for switching P2Y12 receptor inhibitors (a.k.a. thienopyridines) during the course of hospitalization. The extent of switching during an ACS is not well described. The purpose of this study was to describe the switching patterns between clopidogrel and prasugrel during hospitalization and at the time of discharge.

Methods: We conducted a retrospective cohort descriptive analysis using electronic health record data from patients admitted and discharged from two hospitals within Geisinger Health System. Patients were included if they were discharged between 2010 and 2012 with a principal discharge diagnosis of ACS defined by select ICD-9 codes. Use of thienopyridines was determined at three time points: admission, any time use during hospitalization, and discharge.

Results: 3357 patients were included in the cohort; 2837 (84.5%) were not taking any thienopyridine upon admission. During the peri-ACS hospitalization period, 238 (7.1%) of patients switched from one thienopyridine to another at least once; 24 (0.7%) patients underwent back-and-forth switching. Among the 520 patients taking a thienopyridine on admission, 507 were taking clopidogrel only, 11 were prescribed prasugrel only and two patients were prescribed both clopidogrel and prasugrel. The majority on clopidogrel at admission did not switch during hospitalization (430/509, 84.5%). Among 355 (10.6%) patients prescribed prasugrel during hospitalization, 35.8% continued at discharge whereas the majority switched to clopidogrel (65.9%). Approximately one-third of the entire ACS population studied were not prescribed a thienopyridine during hospitalization 1019 (30.4%) or at discharge 1210 (36.1%). Seventeen patients were erroneously prescribed both clopidogrel and prasugrel at discharge.

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Conclusion: Among patients admitted for ACS, thienopyridine switching is not uncommon. Frequent switching can lead to potential medication errors (e.g. patients discharged on two thienopyridines) warranting careful review of medication profiles prior to hospital discharge.

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Board#-Day
18-T

Category: Clinical Service Management

Title: Impact of student pharmacist interventions in an interprofessional Student-Run Clinic

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Purpose: The Accreditation Council for Pharmacy Education (ACPE) notes the importance of interprofessional education in its Accreditation Standards for Pharm.D. programs in the United States. The ability to work in interprofessional teams to promote holistic patient well-being is an important education outcome for all Pharm.D. students. The Student-Run Clinic (SRC) at the University of Southern California is an interdisciplinary clinic that provides a unique opportunity for pharmacy students to collaborate with other professions to make medication interventions and provide medication reconciliation services. The purpose of this study was to assess the number and types of medication interventions made by student pharmacists at the SRC.

Methods: Pharmacy students volunteering at the SRC on select weekends between February 2014 and March 2015 at the USC-Eisner Family Medicine Center or the John Wesley Community Health (JWCH) Weingart Clinic performed a medication reconciliation at the beginning of each patient visit. Medication related problems (MRPs) were recorded and documented by each pharmacy student and discussed with a pharmacist preceptor. Pharmacy students collaborated with other professionals, including occupational therapy, medical, and physician assistant students, to discuss MRPs and form a treatment plan including clinical interventions. Medication Therapy Intervention Documentation Forms (MTIDFs), adapted from Dr. Steven Chen at USC, were used to document interventions made by pharmacy students according to type of MRP and type of action taken.

Results: Pharmacy students documented 71 interventions for 33 different patients from February 2014 to March 2015. Medication interventions were made for a wide range of drug classes, including antidepressants, vaccinations, antibiotics, and nonsteroidal anti-inflammatory drugs (NSAIDs). Indications for these medications varied considerably, including psychiatric disorders such as depression and schizophrenia, as well as other chronic diseases like hypertension, asthma, and hyperlipidemia. MRPs identified were most commonly related to untreated medical problems, poor adherence, or suboptimal treatment. Student pharmacists also identified medication safety issues, such as duplicated therapies, contraindicated medications, and drug interactions. The most common pharmacy student intervention (35%)

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involved recommending initiation of appropriate drugs for untreated medical problems. Other interventions included discontinuing inappropriate drugs, substituting drugs, or educating patients on adherence or proper medication administration.

Conclusion: Through interprofessional collaboration at the USC SRC, pharmacy students can make meaningful medication interventions for patients. Pharmacy student involvement and contribution at the SRC can help interprofessional care teams identify, document, and solve medication related problems. Volunteering at the SRC is a means to help student pharmacists develop their clinical skills while working in teams. MTIDFs are an effective way to measure pharmacy student contributions at the clinic and communicate medication interventions with other team members.

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Board#-Day
19-T

Category: Clinical Service Management

Title: Compounding of aripiprazole as a gummy drug using commercially available products

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Purpose: About a half of patients with schizophrenia have poor medication adherence, resulting in recurrence of schizophrenia. Gummy drugs, shaped confectionary dosage forms, can be easily chewed and swallowed without water. Schizophrenic patients could easily take this formulation daily, improving medication adherence. Our goal was to compound gummy drugs containing aripiprazole (ARP) using commercially available ARP products as a hospital formulation.

Methods: Three ARP formulations (orally disintegrating tablets, ODTs; powder formulations; and oral solutions) were modified to gummy drugs (OD-G, PW-G, and OS-G, respectively). Hydrochloric acid, gelatin solution, and each ARP formulation 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 aripiprazole/7.0 g of gummy drug) by using a syringe, and then cooled to prepare OD-G, PW-G, and OS-G. Next, we created concentrated OD-G (ARP-G) containing 6 mg of ARP in a 3.5 g gummy using the same technique, but substituting citric acid for hydrochloric acid. The amount of ARP in the gummy drug was measured upon initial concoction and after 3 months of storage at 4 degrees Celsius and 30 degrees Celsius. A dissolution test was conducted in accordance with Japanese Pharmacopoeia dissolution test method 2 (paddle method). Serum concentrations of ARP were determined after oral administration of ARP-G and ARP (Abilify) tablets in Beagle dogs.

Results: We were able to modify ARP ODTs, powders, and oral solutions into gummy drugs by using commercially available ARP products. In terms of appearance, OD-G and ARP-G were transparent white, PW-G was shiny opaque white, and OS-G was chalky white with a rough surface. The average content of all formulations exceeded 95 percent of 6 mg. The dissolution rate of whole ARP-G in 15 min was 58.9 percent at pH 5.0, which showed a value between the commercially available tablets and ODTs (46.7 and 91.3 percent, respectively). We assumed patients taking gummy drugs will chew and divide them into several pieces. Therefore, the dissolution test was conducted with ARP-G divided into 2 to 8 pieces. As the number of

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divisions increased, the speed of dissolution also increased. The average dissolution rate of ARP-G divided into 8 pieces was similar to that of tablets and ODTs. The amount of ARP in gummy drugs did not significantly change after storage. There were no significant differences in C_{max} and the 0 to 24 h AUC between ARP-G and tablets after oral administration in Beagle dogs.

Conclusion: We were able to develop ARP gummy drugs by using commercially available products as hospital formulation. This process did not require special equipment. Because patients can easily take gummy drugs daily, ARP-G will help improve medication adherence.

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Professional Poster Abstract

Board#-Day
20-T

Category: Drug Information

Title: Expanded patient counseling opportunities for pharmacy students on an inpatient internal medicine rotation

Primary Author: Allison Mann; **Email:** allison.m.mann1@gmail.com

Purpose: Patient counseling is an important component of the pharmacy school curriculum. Pharmacy students often experience a large amount of their training in this area as part of their fourth year Advanced Pharmacy Practice Experiences (APPEs). Many acute care inpatient APPE rotations emphasize discharge counseling as the main mode of practice in this area. While this is an important activity, there may be other potential missed opportunities to utilize pharmacy student facilitated patient counseling as a means to improve patient care and understanding of health. In an effort to improve patient comprehension related to inpatient pharmacotherapy, the patient counseling expectations for fourth year pharmacy students (P4) completing an internal medicine rotation were expanded to include an increased emphasis on patient counseling throughout the entire patient stay.

Methods: Fourth year pharmacy students completing an internal medicine rotation at a community hospital were instructed to focus on patient counseling related to new medications. As part of their patient work up each day for patients on one teaching team, the pharmacy students identified new medications that were ordered or given within the last 24 hours, and proceeded to counsel on these medications. To enhance patient comprehension and understanding during their time of illness, the students kept these counseling sessions brief and focused mainly on conveying the indication and common side effects of the new medication. When a medication was identified to be ordered at discharge as well, then the student would return to complete a more comprehensive discharge counseling session. All counseling encounters were logged by date and by medication(s) and took place on a single nursing unit. The nursing staff were aware of pharmacy student counseling activities, but continued their standard procedure which also included education related to new medications. Feedback from nursing staff, pharmacy students, and preceptors was gathered to assess the perceived value and feasibility of the expanded counseling activities. Additionally, scores on the hospital consumer assessment of healthcare providers and systems (HCAHPS) survey were used to assess any change in the medication related survey questions, which might indicate a change in patient comprehension.

Results: During the first round of rotations (8 week block), pharmacy students logged 93 encounters related to this new, abbreviated counseling format. Nursing staff feedback regarding the experience was generally positive, with the nursing staff supervisor expressing a desire to continue the activities and expand pharmacy student engagement to all beds on the

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unit. The opinion of the primary pharmacist preceptor involved was that the activity fit well within the scope and schedule of rotation activities, and provided valuable practice in patient interactions. Pharmacy students expressed that the high frequency of counseling sessions enhanced their comfort level in terms of speaking with patients and they felt it was valuable for establishing continuity of care due to the frequent visits with patients during their stay. The nursing units quarterly HCAHPS composite score related to the pharmacy questions on the survey showed an improvement during the quarter that the students were on rotation on the unit (60% versus 68%).

Conclusion: A focus on expanded opportunities for patient counseling during a P4 internal medicine APPE proved to be a positive addition to the rotation activities and fit well into the daily student workflow. Feedback on the enhanced counseling activities was favorable from all involved parties. Though a slight improvement was seen in HCAHPS scores for the quarter in question, the short timeframe of the student rotation and incomplete coverage of the entire nursing unit makes it difficult to draw clear conclusions from this trend.

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Professional Poster Abstract

Board#-Day
21-T

Category: Drug-Use Evaluation

Title: Combining powder formulations of drugs with food and beverages to improve palatability

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Purpose: Flavor of medicines significantly affects patient compliance. Pediatric patients often refuse syrup or powder formulations owing to their unpleasant taste. In such cases, these formulations are often combined with food and beverages to improve palatability. However, this practice has not been adequately investigated. The purpose of this study was to evaluate whether or not combination with food or beverages improves the palatability of powder formulations of drugs for pediatric patients.

Methods: A sensory taste test was performed on 13 to 16 healthy adult volunteers (age range, 23 to 25 years). Powder formulations of fexofenadine (dry syrup 6 percent), azithromycin (powder 10 percent), and carbocisteine (dry syrup 50 percent) were used. All test formulations were kindly donated by Towa Pharmaceutical. Co. Ltd. (Osaka, Japan). In a randomized crossover trial, the subjects evaluated bitterness and overall palatability of the powder formulations by holding fexofenadine, azithromycin, or carbocisteine in their mouths with food or drink (water, sports drink, yogurt, and ice cream) for 30 s. After spitting out the mixture, medications were rated for bitterness and overall palatability using the visual analog scale (VAS) with a maximum value of 100 mm. In addition, subjects used VAS scores to rate how highly they would recommend each combination for use in pediatric patients. All subjects gave written informed consent, and the study protocol was approved by the Ethics Committee of the University of Shizuoka, Japan.

Results: The VAS scores for bitterness of fexofenadine, azithromycin, and carbocisteine taken with water were 42.4, 57.8, and 7.7, respectively, suggesting that azithromycin was the most bitter and carbocisteine was the least bitter drug. The overall palatability of azithromycin was the lowest. VAS scores for overall palatability of fexofenadine and azithromycin significantly increased by 1.8- and 2.8-fold, respectively, when taken in combination with ice cream. Combination with yogurt significantly increased the VAS scores for overall palatability of fexofenadine and carbocisteine by 2.2- and 1.3-fold, respectively. On the other hand, VAS

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scores for palatability decreased when azithromycin was taken with yogurt and sports drink. Regarding the subjects' recommendations for use in pediatric patients, azithromycin showed the highest VAS scores when combined with ice cream and fexofenadine and carbocisteine showed the highest VAS scores when combined with yogurt.

Conclusion: The results of this study indicate that yogurt improves the palatability of fexofenadine and carbocisteine while ice cream improves the palatability of azithromycin and fexofenadine. Moreover, the test subjects recommended these same combinations for pediatric patients. This study suggests that some foods and beverages improve the palatability of powder formulations, decreasing the possibility that pediatric patients will refuse medications owing to unpleasant taste.

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Professional Poster Abstract

Board#-Day
22-T

Category: Drug-Use Evaluation

Title: Relationship between plasma concentration and salivary flow rate after single-dose oral administration of propiverine in healthy volunteers

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Purpose: Overactive bladder (OAB) is a syndrome characterized by urinary urgency accompanied by urinary frequency and nocturia. Antimuscarinic agents, such as oxybutynin, solifenacin, and propiverine, are among the first-line pharmacotherapies available for OAB. However, these drugs are accompanied by bothersome side effects, particularly dry mouth, caused by the inhibition of salivary gland muscarinic receptors. In this study, we evaluated the relationship between propiverine pharmacokinetics and pharmacodynamics after single-dose oral administration in healthy volunteers.

Methods: An open-label, randomized, single-center, two-period crossover study was conducted on 10 healthy Japanese men (age; 23.9 plus or minus 2.8 years; body mass index; 21.8 plus or minus 2.1 kg/m²). In the propiverine administration phase, they were orally administered 20 mg propiverine (BUP-4 tablet, Taiho Pharmaceutical Co.,Ltd.) after fasting overnight. In the control phase, 20 mg of propiverine was administered by 10 percent propiverine cream to the lower arm. Blood samples were obtained at 0, 1, 2, 3, 5, 7, 10, 24, and 72 h after administration, and plasma drug concentrations were measured. At 0, 1, 3, 5, 7, 10, and 24 h after administration, salivary flow rate and dry mouth were assessed by the Saxon test and visual analogue scale (VAS) with a maximum of 100 mm, respectively. The study protocol was approved by the Institutional Review Board of Oita University Hospital.

Results: In the propiverine phase, the mean plasma propiverine concentration reached a maximum at 3 h after oral administration (56.8 plus or minus 2.8 ng/mL). In contrast, plasma propiverine concentrations were lower than the quantitation limit (less than 1 ng/mL) at all sampling times during control phase. The salivary flow rates at 5 h and 10 h in the propiverine phase were significantly lower than those at the control phase. These results indicate that the salivary flow rate was significantly decreased by oral propiverine administration. The relationship between plasma concentration and the decrease in salivary flow rate, which was assessed from the control phase values, exhibited a clear counterclockwise hysteresis curve,

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suggesting a delayed pharmacodynamic effect. There was no significant correlation between salivary flow rate and VAS value for dry mouth.

Conclusion: Oral administration of propiverine tablets decreases salivary flow rate, which may be associated with dry mouth, the typical side effect of antimuscarinic agents. Nevertheless, a significant correlation was not observed between salivary flow rate and VAS values for dry mouth. In addition, this study suggests that the pharmacodynamic effects of propiverine are delayed by its pharmacokinetics.

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Board#-Day
23-T

Category: Drug-Use Evaluation

Title: Evaluation of antibiotic use for urinary tract infections in community pharmacies in Lebanon

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Purpose: Urinary tract infections (UTIs) are one of the most commonly occurring bacterial infections worldwide requiring antibiotic therapy. However, inappropriate antibiotic prescribing, including the incorrect drug/dose/duration, and/or poor compliance, contribute to antibiotic resistance, which is a serious health concern. The objective of this study was to assess the use of antibiotics in the treatment of UTIs in women presenting to community pharmacies across Lebanon.

Methods: One hundred and fifty eight adult female patients, aged 18 years and above, using any prescribed antibiotic for the treatment of any type of UTIs were interviewed in 21 community pharmacies all over Lebanon during a 4-month period in the spring and summer of 2014. All women using antibiotics for any infection were included initially and a total of 323 women were approached. A structured questionnaire was used to collect data and the collected data was entered into the Statistical Package for Social Sciences (SPSS) software for analysis. Evaluation of the appropriate use of the antibiotics was based on the most current Infectious Diseases Society of America (IDSA) guidelines and clinical judgment. The study was approved by the University Institutional Review Board (IRB) and a waiver of consent was obtained to fill out the questionnaire.

Results: Of the 323 women approached, 158 women (50 percent) were using antibiotics for UTIs. Around 59 percent of those were between the age of 30 and 40 years old. Among women using antibiotics for UTIs, 71 percent and 18 percent were suffering from uncomplicated cystitis and pyelonephritis respectively. The most commonly prescribed antibiotic class for UTIs was fluoroquinolones (74 percent). Ciprofloxacin was the mostly prescribed (58 percent) fluoroquinolone antibiotic. Urine cultures were not obtained in 72 percent of patients with UTIs. Most of the patients with uncomplicated cystitis were prescribed fluoroquinolones (96 percent). All patients with pyelonephritis were treated with fluoroquinolones with appropriate doses and duration of therapy. Fluoroquinolones are not recommended, according to the most current IDSA guidelines as first line agents for uncomplicated cystitis because of the propensity to cause collateral damage, but they are the first line empiric therapy in pyelonephritis. Nitrofurantoin, which is considered to be an appropriate first-line choice for acute uncomplicated cystitis treatment according to the IDSA guidelines, was not prescribed to any patient during this study. Eventhough fluoroquinolones have high resistance prevalence in Lebanon (up to 50% of Escherichia coli strains are resistant to ciprofloxacin), they were the

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most commonly prescribed antibiotics for UTIs in our study. More than 95% of the *Escherichia coli* strains in Lebanon are susceptible to nitrofurantoin.

Conclusion: A significant percentage of women suffer from UTIs and are treated with antibiotics without obtaining cultures. In addition, most of the antibiotics were selected and prescribed without following the IDSA guidelines. These prescriptions can contribute to the further development of antibiotics resistance and collateral damage in the community. Thus, the Lebanese pharmacists should collaborate with physicians in order to select the optimal therapy to patients and increase the usage of nitrofurantoin as a first line agent for uncomplicated cystitis in women.

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Professional Poster Abstract

Board#-Day
24-T

Category: Drug-Use Evaluation

Title: Statewide collaboration to review targeted oral anticoagulant use

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Purpose: Dabigatran and rivaroxaban are two targeted oral anticoagulants (TOACs). Dabigatran and rivaroxaban require dose adjustments based on kidney and/or liver function and monitoring of concomitant medications that can effect coagulation and possibly results in an increased bleeding risk. This medication use evaluation was undertaken to review the indication for use and dosing as well as adverse reactions and treatment failures.

Methods: A retrospective chart review was completed for adult in-patients admitted to participating Rhode Island hospitals between January 1 and March 31, 2013. All of the participating hospitals received Institutional Review Board approval for this study. The following indicators were reviewed: indication for use, dose, presence or absence of a pharmacist intervention, presence or absence of concomitant medications including proton pump inhibitors/acid suppressants, platelet inhibitors, other anticoagulants, non-steroidal anti-inflammatories or selective serotonin reuptake inhibitors. Lastly, any adverse reactions (bleeding, dyspepsia) or treatment failures were recorded.

Results: Seven of the eleven acute care hospitals in Rhode Island participated in this study. There were 308 total patients reviewed of which 122 received dabigatran and 186 received rivaroxaban. Dabigatran's indications included atrial fibrillation (110), treatment of deep vein thrombosis or pulmonary embolism (DVT/PE) (10) and other (2). Treatment continued from prior to admission for 79 (65%) of the dabigatran patients. Rivaroxaban's indications included atrial fibrillation (92), orthopedic post-operative DVT prophylaxis (60), treatment of DVT or PE (31), and other (3). Treatment continued from prior to admission for 60 (32%) of the rivaroxaban patients. Pharmacists documented 65 interventions for renal dosing; no hepatic dose adjustments were reported. There were 444 potential drug-drug interactions identified. These included PPIs or acid suppressants (144), platelet inhibitors (139), miscellaneous agents (83) and other anticoagulants (78). A total of 20 adverse reactions were reported and described as documented bleeding (16) and dyspepsia (4). Six patients were reported as treatment failures. Twenty-three of those events occurred in patients 60 years of age or older. This

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included five treatment failures. Albumin results were available for 155 patients. Of those with an albumin less than 3.2mg/dl, a higher rate of side effects were observed.

Conclusion: The use of both dabigatran and rivaroxaban was in accordance with their Food and Drug Administration approved indications in the majority of cases reviewed. Pharmacists played a role in optimizing treatment. The possible association between low serum albumin and adverse reactions warrants further investigation.

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Professional Poster Abstract

Board#-Day
26-T

Category: Drug-Use Evaluation

Title: Evaluation of intra-operative liposomal bupivacaine and non-liposomal anesthetic for pain control in orthopedic surgery

Primary Author: Anthony Scriver; **Email:** Anthony.Scriver@HCAhealthcare.com

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Purpose: The use of an intra-operative local anesthetic injection for pain control in orthopedic surgery (total knee arthroplasty, total hip arthroplasty) is a common component of multimodal pain control. The goal of an intra-operative local anesthetic injection is to minimize the overall use of post-surgical opiates, decrease time to ambulation (which may decrease venous thromboembolism and infection risks), facilitate earlier hospital discharge and improve pain scores / patient satisfaction. Established approaches for intra-operative local anesthetic injection include the use of liposomal bupivacaine or the use of either bupivacaine or ropivacaine with lidocaine in combination with an opiate or non-opiate pain medication and corticosteroid. The purpose of this evaluative report was to compare patient pain scores, length of stay, opiate use, venous thromboembolism rate, opiate related fall and opiate reversal usage in orthopedic surgical cases using one of four established intra-operative pain management regimens.

Methods: This review was undertaken as a medication use evaluation for the Pharmacy and Therapeutics committee and Medical Executive committee at the facility. This retrospective evaluation assessed established regimens used within the operating room setting of the hospital for intra-operative pain management of total knee arthroplasty and total hip arthroplasty cases. The four established regimens reviewed were: no intra-operative local anesthetic injection with patient controlled analgesia and intravenous / oral pain medications post-operatively (regimen A), intra-operative injection of liposomal bupivacaine 266mg and 30ml of bupivacaine adjunct with intravenous / oral pain medications post-operatively (regimen B), intra-operative injection consisting of ropivacaine 1%, lidocaine 1%, morphine 10mg, methylprednisolone acetate 40mg and epinephrine 0.5mg with intravenous / oral pain medications post-operatively (regimen C) and intra-operative injection consisting of ropivacaine 1%, lidocaine 1%, morphine 10mg, methylprednisolone acetate 40mg and epinephrine 0.5mg with bupivacaine elastomeric pump and intravenous / oral pain medications post-operatively (regimen D). The average pain scores post-operative day zero through five, length of stay, opiate use, venous thromboembolism rate, opiate related fall and opiate reversal usage of each regimen was compared.

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Results: A total of seventy two patients (18 from each regimen) were retrospectively evaluated with thirty seven patients undergoing total knee arthroplasty and thirty five patients undergoing total hip arthroplasty. The average patient age was comparable for all regimens (regimen A = 68.1, regimen B = 63.8, regimen C = 67.5 and regimen D = 68.8). The average post-operative pain score for day 0 through 5 was lower in regimen D (average pain score = 3.5) when compared to the average pain score achieved by regimen A (average pain score = 4.4), regimen B (average pain score = 5.1) or regimen C (average pain score = 4.4). The average length of stay was lower for regimen D (3.6 days), when compared to regimen A (4.61 days), regimen B (4.27 days), or regimen C (4.4 days). Patients in all four regimens used comparable amounts of intravenous and oral pain medications post-operatively. There were no venous thromboembolism events, opiate related falls or opiate reversal needed for any of the patients evaluated.

Conclusion: This medication use evaluation demonstrated that the combination of an intra-operative local anesthetic, opiate, and corticosteroid injection with post-operative bupivacaine elastomeric pump provides an effective surgical pain management strategy when compared to liposomal bupivacaine. This particular regimen may provide optimal post-surgical pain management and decrease length of stay when compared to other established pain management regimens, including the liposomal dosage form of a local anesthetic as an intra-operative injection.

ASHP 2015 Summer Meetings Professional Poster Abstract

Board#-Day
27-T

Category: Emergency Medicine / Emergency Room

Title: Intranasal naloxone rescue kit program evaluation by patient telephone questionnaire

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Purpose: This program was evaluated utilizing a telephone questionnaire of patients who received a prescription for an intranasal naloxone rescue kit (INRK) at our institution. Those who were prescribed an INRK are high-risk opioid users or at high-risk to witness an overdose. The questionnaire was developed with specific questions targeted to assess memory of education and if other learning methods would have been preferred.

Methods: This is a retrospective, observational, quality assurance study. Patients were contacted by the pharmacy intern via telephone if they had filled their INRK prescription from July 4, 2013 to October 14, 2014. Descriptive statistics will be utilized to describe responses to the questionnaire regarding several aspects of the education the patient initially received.

Results: We identified 96 patients to have filled their INRK from our outpatient pharmacy, with 48 being included in the analysis. The remaining were lost to follow-up or chose not to participate when contacted. 97% of patients have their INRK stored in an appropriate location. 31.3% suggested a pharmacist do the education vs. 43.8% by a physician. The most requested form of education was by direct verbal education and self-demonstration at 71% vs 21% by video demonstration. Of those who used their INRK for an overdose (n=3), all were successful in reversal of the overdose which demonstrates they remembered how to use the INRK appropriately.

Conclusion: Our patient questionnaire was utilized to assess whether patients thought our current discharge counseling of INRK was appropriate or if they would have preferred other methods. Currently, we use a combination of pharmacists, pharmacy interns and health educators to do in-person education and demonstration with the patients. Due to 3 successful overdose reversals using the INRK we suspect our current program is adequate but minor changes in our education plan will occur.

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Professional Poster Abstract

Board#-Day
28-T

Category: General Clinical Practice

Title: Patient acceptance and impact of a bedside discharge prescription delivery service

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Purpose: According to the Centers for Disease Control and Prevention, 20 to 30 percent of medications prescribed at hospital discharge are never filled. Patients with heart failure are among the highest risk groups for readmissions. In an effort to improve transitions of care and reduce 30-day readmission rates, heart failure patients were offered to have new prescriptions filled and delivered to bedside upon discharge. A one-month pilot was conducted to assess patient acceptance and resources needed to sustain such a service.

Methods: For one month, patients admitted with heart failure were offered to have new prescriptions filled and delivered to bedside. Patients with one or more of following criteria were excluded from the pilot: younger than eighteen years of age, patients with ventricular assist devices, currently listed for heart transplant, and individuals who were not discharged to home. The pharmacy resident or a fourth year pharmacy student offered the service to patients admitted on two cardiac nursing units. The on-campus outpatient pharmacy was then utilized by the resident to fill new prescription(s) and deliver them to bedside. All patients discharged, whether declining or accepting the service, were provided medication counseling. Time was tracked to estimate resources needed to sustain the service. Patients were contacted within five days of discharge to assess patient satisfaction and prescription fill rates for those who declined the service. Thirty-day readmission rates were also evaluated.

Results: During the pilot 73 patients were initially identified, 25 of which accepted the service, 23 declined the service, and 25 were excluded. Two patients who accepted and one patient who declined were later excluded due to discharge disposition. An average per patient of 24 minutes was spent offering the service and 62 minutes to fill, deliver, and provide discharge counseling. Of the patients who accepted and declined the service, 92 percent and 43 percent respectively said they would use the discharge prescription service in the future. Patient satisfaction assessed by questionnaire during the follow-up phone calls was 99 percent for both the accepted and declined groups. Of those who declined the service, 35 percent reported not having new prescriptions filled the day of discharge. Thirty-day readmission rates for those heart failure patients accepting the service was 12 percent compared to baseline of 20.3 percent.

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Conclusion: The service was accepted by 54 percent of heart failure patients offered. According to scores received during follow-up phone survey, patients were both highly satisfied with the service as well as counseling received at discharge. Sample size was too small to determine impact on thirty-day readmission rates. Processes were evaluated and re-mapped in order to determine additional resources necessary to sustain the bedside discharge prescription delivery service utilizing outpatient pharmacy personnel.

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Professional Poster Abstract

Board#-Day
29-T

Category: General Clinical Practice

Title: Pharmacist led transition of care/medication education program pilot within an inpatient rehabilitation unit

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Purpose: Re-admission rates nationwide have been increasing with around 20 percent of Medicare beneficiaries readmitted within 30 days of discharge. Medication non-compliance contributes to both increased hospital readmission rates and an increase in health care spending. Oftentimes, during a hospital admission, new medications are added, doses are adjusted, and existing therapies are discontinued. Patient and caregiver teamwork is essential for improving transitions of care, and pharmacists can provide appropriate recommendations for changes in therapy based on individual patient needs. In an approach to bridge the communication gap, hospital pharmacists can provide a reconciled medication list and meet with patients for counseling and education prior to discharge. The hospital pharmacist can then collaborate with the community pharmacist to further improve adherence outcomes and decrease overall medication related problems.

Methods: The baseline population included all patients discharged home from Baptist Health Medical Center- North Little Rock Rehabilitation unit from October through December 2014. Baseline data collection was performed via documented re-admission rates and clinical intervention per patient discharge. During the month of January 2015, clinical pharmacy services provided transitions of care and medication therapy management services to the rehabilitation unit. These included conducting home medication history collection, medication reconciliation, and discharge counseling. Discharged patients were provided medication counseling and all changes to medication therapies were verbally communicated to the patients outpatient pharmacy.

Results: Baseline data collection showed that in the months of October through December 2014, 159 patients were discharged from the Baptist Health Medical Center Rehabilitation unit and 193 interventions were documented by clinical pharmacy services, resulting in an average of 1.23 documented clinical pharmacy interventions per patient discharge. Readmission rates for October, November, and December 2014 were 12.28, 6.38, and 16.98, respectively. In January 2015, 64 patients were discharged from the Rehabilitation unit with 199 documented clinical pharmacy interventions, resulting in an average of 3.11 documented clinical pharmacy interventions per patient discharge. Readmission rates for January were 15.63.

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Conclusion: Clinical pharmacy interventions increased more than two-fold during the pilot month. Baptist Health Medical Center- North Little Rock Rehabilitation units readmission rates are currently below the national average. The presence of a clinical pharmacist in the rehabilitation unit has improved documented clinical activities and has also been well received by the medical, nursing, and therapy staff members.

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Professional Poster Abstract

Board#-Day
30-T

Category: Home Care

Title: Effect of pharmacist drug therapy interventions for geriatric patients in independent living facilities

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Purpose: Pharmacy services have expanded with the implementation of medication therapy management programs. However, some patients are currently unable to access these services. Providing comprehensive medication reviews (CMR) in a patients home presents an opportunity for pharmacists to impact geriatric patients. This study evaluates the effects of pharmacist-provided home-based CMRs on drug therapy problems for geriatric patients.

Methods: This pre-/post intervention study examined the overall effect of pharmacist-provided home-based CMRs. Patients were included if they were age >65, had >3 medications for chronic disease states, used the medication delivery service, and lived in an independent living facility with no outside assistance for medication administration. For each patient, a pharmacist conducted a CMR, and potential drug therapy problems across 17 criteria were identified at baseline. After the pharmacist discussed the interventions with the patients, they were mailed a medication action plan, and their physician was contacted if a new prescription was needed. The patient profiles were analyzed monthly for 3 months after the original CMR for continuous evaluation of the interventions made during the visit. The number of drug therapy problems identified during the original CMR was compared to the number of drug therapy problems that remained after 3 months. The average number of drug therapy problems resolved was used to assess whether the results were statistically significant. The pre-study alpha was set at 0.05. A paired two-tailed t-test was used to analyze the data and descriptive statistics were used to assess patient demographics.

Results: Twenty-five patients participated with an average age of 84.2 years old. The majority of participants (72%, n=18) were women. There was an average of 3.4 2.1 (mean standard deviation) drug therapy problems identified per patient at baseline. After 3 months the average number was reduced to 1.5 1.6 (p<0.05). The average number of drug therapy problems resolved was 1.9 1.7. The sharpest decrease in the number of drug therapy problems occurred within the first month after the CMR. However, the number of problems continued to decrease throughout the following 2 months.

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Conclusion: Pharmacist-provided home-based CMRs for geriatric patients in independent living facilities demonstrated benefit by decreasing the overall number of drug therapy problems. Since the majority of changes occurred in the first month, it is suggestive that the primary benefit came from the initial face-to-face intervention from the pharmacist.

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Board#-Day
31-T

Category: I.V. Therapy / Infusion Devices

Title: We push, pump and drip-drop, but what are our patients getting? Observation of intravenous medication preparation and administration practices

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Purpose: Medication administration via the intravenous (IV) route is known to be hazardous¹, with high preparation and administration error rates noted in observational studies². This study aimed to determine: 1. if IV medicines are prepared and administered in accordance with hospital guidelines and 2. the proportion of the prescribed dose received by patients with current infusion practices.

Methods: Robert Gordon University Research Ethics Committee (REC) approval and hospital REC Chairmans approval were granted. A paper-based data collection form based on reported observational studies^{2,3} categories was piloted, adjusted and finalised. A single trained pharmacist observed a convenience sample of IV drug preparation and administration meeting study inclusion criteria during a two hour data collection period per day on 14 adult medical/surgical in-patient wards over six weeks in February and March 2014. Participants were observed once only and gave informed consent prior to observation. Data (participant demographics, preparation and administration details) was recorded on the ward and observations subsequently checked against hospital guidelines. Data was analysed using SPSS and descriptive statistics compiled.

Results: 105 IV drug preparations and 66 IV drug administrations by nurses were observed. Gravity (n=28) and slow IV injection (n=26) were most commonly observed, followed by infusion by volumetric infusion pump (n=12). Syringe pump/driver infusions were not observed due to the longer duration of infusion. Hospital guidelines (IV monographs) were referred to in 40% (42/105) of preparations. The volume or type of reconstitution or diluent fluid differed from guidelines in 21% of preparations (22/105). An incorrect dose was prepared on 3 occasions but identified by the checking nurse and corrected in all cases. 73% (48/66) of administrations were outside recommended rates. 65% of IV injections were more than 100% faster and 36% of gravity infusions more than 50% slower than recommended. Medication remained in the giving set and/or infusion bag at the end of the infusion and was discarded, resulting in under-dosing in 95% of observed infusions. This was in line with hospital guidelines and practice at the time, with flush of the patient's cannula but not the giving set post-administration.

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Conclusion: Medication was prepared and administered in line with guidelines in 21% of observations (8/66). Under-dosing due to medication remaining in the line and/or bag occurred with 95% of infusions. Changes to hospital policy, practice and training are required to ensure the entire IV giving set is flushed to administer of the full dose and to ensure administration at the recommended rate. References: 1. Berdot S, Sabatier B, Gillaizeau F, Caruba T, Prognon P, Durieux P. Evaluation of drug administration errors in a teaching hospital. BMC Health Services Research. 2012; 12(1):60 2. Taxis K, Barber N. Ethnographic study of incidence and severity of intravenous drug errors. BMJ 2003; 326(7391):684. 3. Allan E, Barker K. Fundamentals of medication error research. American Journal of Health-System Pharmacy. 1990; 47(3):555-571.

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Professional Poster Abstract

Board#-Day
32-T

Category: Investigational Drugs

**Title: Cannabidiol: Challenges in human clinical trial implementation at Mayo Clinic
Investigational Drug Service pharmacies**

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Purpose: Cannabidiol demonstrates pharmacological activity that has led to epilepsy research in patients with intractable seizures, among other disorders. In 2014, medical cannabis legislation was signed into law and a Task Force on Medical Cannabis Therapeutic Research was created in the state of Minnesota. Our institution encountered significant challenges for implementation and execution of human clinical trial protocols involving cannabidiol due to its Schedule I Controlled Substance designation and inconsistencies between Drug Enforcement Agency (DEA) and Minnesota Board of Pharmacy regulations.

Methods: Pharmacy leadership, in conjunction with Investigational Drug Service specialists expertise, examined and detailed the requirements for Schedule I Controlled Substance management with the regional Drug Enforcement Agency (DEA) Diversion Investigator in collaboration with guidance from the Minnesota Board of Pharmacy. Best practice approaches were developed to adhere to institutional medication use guidelines and state and federal regulations. In anticipation of additional research protocols involving a Schedule I Controlled Substance, the procedure needed to allow for replication under additional researchers protocols.

Results: Significant pharmacy challenges were identified involving Schedule I Controlled Substance DEA licensure requirements, Minnesota Board of Pharmacy regulations, DEA security requirements and access limitations, and institutional guidelines on medication management processes. Using a novel dispersing/distribution process and pharmacy software approach, the outpatient pharmacy setting with existing facility security, presented a favorable environment for investigational drug management due to limited access for very few Investigational Drug Pharmacy staff.

Conclusion: Working with multiple regulatory bodies at local, state, and federal levels, the first cannabidiol studies are moving toward patient enrollment at our institution for human clinical trials in epilepsy.

ASHP 2015 Summer Meetings Professional Poster Abstract

Board#-Day
33-T

Category: Leadership

Title: Development of a health-system administration management advanced pharmacy practice experience (APPE) rotation at a 203-hospitals health-system corporate office

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Purpose: The Affordable Care Act has stimulated hospital and health-system mergers and acquisitions, creating integrated health care services that require strong leadership and management to foster the continuing growth. While the development of leadership skills is essential, leadership training is inconsistent in both academic and postgraduate practice settings. The health-system administration management APPE rotation was created to enhance students knowledge of leadership and management within a large health-system. This rotation has been offered for three years and improvements of the curriculum have been made over time to ensure the rotation provides a valuable experience to students.

Methods: A rigorous curriculum was established to allow students to actively participate in a variety of health-system related functions crossing both operational and clinical roles. These activities have a special focus on: critical analysis on medical literature, drug information support, medication safety, technology for the medication-use system, sterile product compounding and pharmaceutical waste regulatory standards, standardization of medication use process across health systems, leadership and management skills development, and formulary management. The team of preceptors includes corporate leaders and a fellow with pharmacy, nursing and/or business training. Preceptors bring expertise in business management, informatics, pharmacy operations, nutrition support, critical care, pediatrics, infectious diseases and research. Additionally, in order to enrich students understanding of leadership principles, assist in postgraduate career planning, and keeping students updated on current pharmacy practice, a twice-weekly leadership and management focused topic discussion was added to the existing curriculum. This supplementary activity is comprised of discussion of Harvey A.K. Whitney award lectures on leadership development, postgraduate residency and fellowship training, American Society of Health-System Pharmacist (ASHP) pharmacy practice model initiatives and C-suite management structure. A 1-hour individualized mock interview and curriculum vitae assessment workshop was also incorporated to the curriculum.

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Results: During each 4-week APPE rotation, students were assigned a total of five projects within special focus area, one journal club, one leadership and management topic specific presentation, a 1-hour mock interview and curriculum vitae workshop, and one preceptor-led site visit within the health-system. In addition, a twice-weekly leadership and management topic discussion with required readings, regulatory standards readings, evidence-based research and analysis, and drug information support were also assigned. Students were asked to attend and participate in all business, operations, leadership and clinical support meetings throughout the rotation.

Conclusion: This health-system administration management rotation allows students to experience pharmacy practice aside from the traditional APPE rotations offered. Students have provided highly positive feedback and indicated the rotation has helped them to advance their communication, project management, leadership skills while making an impact on practice at 203 hospitals through the projects they completed on rotation.

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Board#-Day
34-T

Category: Oncology

Title: Receptor occupancy (RO) of the neurokinin-1 (NK1) receptor antagonist, netupitant, in different brain regions and relationship to antiemetic efficacy

Primary Author: Ali McBride; **Email:** alimcbride@gmail.com

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Purpose: Netupitant is a highly selective NK1 receptor antagonist (RA) developed as a fixed oral combination with the pharmacologically distinct 5-HT₃ RA, palonosetron. NEPA (300mg netupitant + 0.50mg palonosetron) uniquely targets two critical emetic pathways as a single-dose agent, providing prevention of both acute and delayed chemotherapy-induced nausea and vomiting (CINV). Specific brain regions associated with netupitant's antiemetic activity remain undefined, although interaction with NK1 receptors in the chemoreceptor trigger zone (CTZ) of the brainstem is expected. The purpose of this analysis was to 1) investigate the pharmacokinetic/pharmacodynamic relationship between the netupitant plasma concentration and NK1-RO in different brain regions and 2) evaluate the possible relationship between NK1-RO of netupitant and efficacy of the NEPA combination over the 120h period of emetic risk.

Methods: NK1-RO was investigated in six different brain regions (striatum, occipital cortex, frontal cortex, anterior cingulate, lateral and medial temporal cortex) of six healthy male subjects following single oral netupitant doses (100/300/450 mg). PET imaging was performed up to 96h post-dose. An Emax model correlating NK1-RO with netupitant plasma concentrations (C) [$RO(\%) = (RO_{max} * C) / (C_{50\%} RO_{max} + C)$] enabled RO estimates for all brain regions and was applied to predict the time course of NK1-RO after 300mg netupitant up to 120h (the end of the efficacy evaluation). In 2 separate pivotal clinical trials in patients receiving either cisplatin-based (N=135) or anthracycline cyclophosphamide (AC)-based (N=724) chemotherapy, the proportions of NEPA-treated patients with no emesis or no significant nausea (NSN: max score ≤25mm on 100mm visual analog scale) were evaluated daily throughout the same time course.

Results: Estimates of RO_{max} and C_{50%ROmax} revealed the following: netupitant had a high binding affinity to NK1 receptors in the different brain regions. Maximal NK1-RO after 300mg netupitant was ≥90% in all regions, except the lateral (83%) and medial (66%) temporal cortex. The highest NK1-RO was in the occipital cortex (99.5%). In the striatum, NK1-RO was achieved at higher netupitant plasma concentrations (C_{50%ROmax}: 8.47 ng/mL), compared

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with other brain regions (C50%ROmax range 0.93 - 1.98 ng/mL). No emesis rates were >96% each day in the cisplatin study and >85% each day in the AC study; daily NSN rates were similarly high (>95% and >85%, respectively) throughout 120h post-dose. Model-predicted NK1-RO for 300mg netupitant revealed that ROmax was reached for all brain regions by 3h. RO declined the fastest for the striatum region (90% at 3h and 6h and 88%, 83%, 80%, 78% and 75% at 24, 48, 72, 96, and 120h, respectively). In comparison the NK1-RO at 120h was 95%, 88%, 89%, 80% and 63% for the occipital cortex, frontal cortex, anterior cingulate, lateral and medial temporal cortices, respectively.

Conclusion: Netupitant is a potent agent with a strong affinity and long lasting degree of NK1-RO in brain regions of interest. The kinetics of netupitant's RO varied between brain regions, likely due to differences in regional blood perfusion, drug diffusion, and NK1 receptor density. The magnitude and temporal profiles of NK1-RO in the striatum and certain brain cortex regions represent suitable surrogate markers for netupitant's binding to NK1 receptors in the CTZ and drug efficacy. While historical PET studies suggest that NK1-RO >90% in the striatum may be associated with antiemetic efficacy of NK1RAs, this threshold is arbitrary and the relationship between varying degrees of NK1-RO and clinical efficacy has not been established. It does not appear necessary to achieve sustained RO >90% in the striatum for netupitant when it is combined with palonosetron in order for effective antiemetic prevention to occur. NEPA resulted in excellent CINV control throughout the 5 days post-chemotherapy in patients at significant emetic risk.

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Professional Poster Abstract

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35-T

Category: Pediatrics

Title: Impact of an intravenous fat emulsion shortage at a free-standing pediatric institution

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Purpose: Drug shortages are an increasing concern in the US, potentially affecting patient therapy. In January 2013, hospitals throughout the US faced a severe shortage of intravenous fat emulsions (IVFE). Despite recommendations from the American Society for Parenteral and Enteral Nutrition (ASPEN), to conserve these limited resources for pediatrics patients, free-standing pediatric institutions received the same allocation of IVFE as adult institutions. The primary objectives of this study are to determine the impact of a nationwide IVFE shortage on the provision of nutrition and the overall growth of patients in a neonatal intensive care unit (NICU) over a six month period.

Methods: This study has been approved by the Institutional Review Board. The electronic medical record will identify patients in the NICU who received parenteral nutrition (PN) between July 2012 and December 2012 prior to an IVFE shortage, and between January 2013 and December 2013 during an IVFE shortage. These patients will then be assessed for the provision of IVFE during these same time periods in which hospital-wide restrictions were implemented to provide at least the minimum amount of IVFE to prevent essential fatty acid deficiency in all patients (average of 0.5g/kg/day of IVFE over a seven day period). The following data will be collected: birth weight, gestational age, gender, admitting diagnosis, initial percentile for weight/length/head circumference, daily nutrition provision (kcal/kg/day), basic/comprehensive metabolic profile panel results, percentage PN versus enteral nutrition (EN), IVFE provided (g/kg/day), days on PN, EN provided, and both weight and percentile for weight/length/head circumference at end of study period/discharge. Provider documentation will be reviewed to determine if the dose of IVFE was decreased due to intolerance or other clinical concerns. All data will be recorded without patient identifiers and maintained confidentially. Differences in the provision of nutrition and the overall growth of the patient prior to and during the shortage will be compared.

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36-T

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Outcomes among patients switching to lurasidone or quetiapine in a commercially-insured schizophrenia population

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Purpose: Psychiatric hospitalizations are a major driver of the direct healthcare costs of schizophrenia. Previous findings (Loebel et al. [2013]) from a 12-month double-blind, clinical trial of patients with schizophrenia demonstrated a reduced risk of hospitalization with lurasidone compared to quetiapine XR. Additionally, a real-world study utilizing Medicaid claims data demonstrated that schizophrenia patients switching to lurasidone had fewer hospitalizations than patients switching to quetiapine. This analysis examined time to hospitalization (all-cause and mental health-related) and associated costs among commercially-insured patients with schizophrenia who switched to lurasidone or quetiapine.

Methods: A retrospective cohort study using the MarketScan Commercial Claims & Encounters Database (10/1/2010−6/30/2013) was conducted. Monotherapy treatment episodes of continuously enrolled adults (at least 6 months before and after treatment initiation) with schizophrenia (International Classification of Diseases, 9th Revision, Clinical Modification [ICD-9-CM] diagnosis code: 295.xx) who initiated lurasidone or quetiapine after switching from another atypical antipsychotic were included (the initiation date was defined as the index date). Patients could be on multiple atypical antipsychotics prior to switching. Treatment episodes were defined as at least 2 lurasidone or quetiapine claims during the post-index period before treatment discontinuation, switch to another antipsychotic or end of study follow-up. Outcomes included were time to treatment discontinuation, time to first hospital admission, all-cause or mental health-related hospitalizations (ICD-9-CM diagnosis code of 290.xx-314.xx any position), direct costs and length of stay (LOS).

Results: Overall 116 lurasidone (mean age: 34.9 years; 54.3% female) and 220 quetiapine patients (mean age: 36.9 years; 43.6% female) with schizophrenia had 118 and 223 monotherapy treatment episodes, respectively. Among lurasidone patients, 27.6%, 25.0%, and 21.6% switched from aripiprazole, risperidone, and paliperidone, respectively. Among quetiapine patients, 35.5%, 22.3%, and 20.0% switched from risperidone, aripiprazole, and

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paliperidone, respectively. Mean time to treatment discontinuation was 78 days for lurasidone compared to 75 days for quetiapine. Mean time to first admission was significantly longer for lurasidone compared to quetiapine for all-cause (75 vs. 51 days) and mental health-related (73 vs. 51 days) hospitalizations, respectively. Lurasidone patients had significantly fewer treatment episodes resulting in all-cause (10% vs. 20%) or mental health-related (9% vs. 19%) hospitalizations compared to quetiapine patients. Mean costs of all-cause hospitalizations were lower for lurasidone, \$16,265, than for quetiapine, \$27,368, ($p < 0.05$). Similarly, mean costs for mental health-related hospitalization were lower for lurasidone, \$16,512, than for quetiapine, \$27,398, ($p < 0.05$). Mean LOS for all-cause hospitalizations was 11 days for lurasidone vs. 9 days for quetiapine and for mental health-related hospitalizations was 13 days for lurasidone vs. 10 days for quetiapine.

Conclusion: This real-world data analysis among commercially-insured patients with schizophrenia suggests that patients who switched to lurasidone had longer treatment persistence and lower hospitalization costs than those who switched to quetiapine. These lower costs with lurasidone may have been driven by fewer episodes with hospitalizations and longer time to first admission.

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37-T

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Cost-effectiveness of edoxaban versus warfarin in the treatment of patients with severe pulmonary embolism: Results based on a subgroup analysis of the Hokusai-VTE study

Primary Author: Ronald Preblich; **Email:** rpreblich@dsi.com

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Purpose: Patients with pulmonary embolism (PE) have high rates of mortality and morbidity and incur a significant healthcare cost burden. Specifically, PE patients with evidence of right ventricular dysfunction as measured by an elevated level of NT-proBNP (≥ 500 pg/mL) are more severe and have an increased risk of death vs. those with less severe PE. Edoxaban, a once-daily non-vitamin K antagonist (VKA) oral anticoagulant was shown to be as efficacious as warfarin in reducing recurrent symptomatic venous thromboembolism (VTE), with significantly less bleeding in a broad spectrum of patients with VTE, including those with severe PE in the Hokusai-VTE Phase 3 study. The objective of our study was to evaluate, from a US integrated healthcare delivery perspective, the cost-effectiveness of edoxaban versus warfarin among severe PE patients based on data from Hokusai-VTE.

Methods: A Markov model evaluated 1-year total direct healthcare costs and outcomes of severe PE patients who were treated with edoxaban or warfarin with flexible treatment durations of at least 3 months and up to 12 months. In Hokusai-VTE, the mean duration of treatment in the severe PE subgroup was 238.5 days with 62.4% receiving more than 6 months of treatment. The model used a monthly cycle with clinical event rates of VTE recurrence, major bleeding, clinically relevant non-major bleeding, and associated healthcare resource use obtained from a post-hoc analysis of data from a subgroup of PE patients with NT-proBNP ≥500 pg/mL in the Hokusai-VTE trial. Patients were allowed to switch to the alternative therapy, as a result of clinical events, once during the model duration. Cost estimates for hospitalization and outpatient visits, including the emergency room, were derived from the 2009-2011 Premier Hospital (Premier, Inc., Charlotte, NC) and Medicare 5% national sample claims databases, respectively. Current Wholesale Acquisition Costs (WAC) for warfarin (\$0.36 per day) and edoxaban (\$9.24 per day) were used in the analysis. Health state utilities associated with clinical events were obtained from the published literature. Cost-effectiveness relative to warfarin was assessed using incremental cost per quality-adjusted life year (QALY) gained ratio. One-way sensitivity analyses were conducted to assess the impact of uncertainty around model inputs or assumptions.

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Results: Over a one-year model period, mean total health care costs for the edoxaban cohort (\$17,843) were lower than for the warfarin cohort (\$20,481), and the mean QALYs were higher for edoxaban (0.846) than warfarin (0.834) in the base case analysis. Edoxaban continued to dominate warfarin (lower mean total health care costs and higher mean QALYs) even when edoxaban price was increased by 20% from the base case value. Decreasing warfarin monitoring cost by 20% again yielded a lower mean total health care cost for edoxaban (\$17,840) compared to warfarin (\$20,294) and continued dominance of the latter. One-way sensitivity analysis varying health state utility estimates based on a range of values derived from published literature showed that the edoxaban cohort retained the higher QALY gain at lower total health care costs across all ranges of parameters tested.

Conclusion: This study suggests that edoxaban therapy is a dominant or cost-saving alternative to warfarin for treatment of patients with severe PE.

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Professional Poster Abstract

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38-T

Category: Practice Research / Outcomes Research / Pharmacoeconomics

Title: Treatment discontinuation and switching patterns by mechanism of action among patients with epilepsy: a retrospective observational study in a US population

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Purpose: Epilepsy is associated with significant morbidity and can result in social exclusion, stigma and unemployment, and represents a substantial clinical, humanistic and economic burden. The aim of treatment for patients with epilepsy is seizure-freedom; however, between 20 and 40% of patients on anti-epileptic drugs (AEDs) become refractory to therapy and remain uncontrolled, often resulting in treatment discontinuations or switches. The purpose of this study was to evaluate discontinuation and switching patterns between AEDs with different mechanisms of action in a real-world setting.

Methods: A retrospective evaluation of treatment patterns was conducted using data from the RealHealthData medical transcription database. Switch and discontinuation patterns of patients with epilepsy were analyzed from data collected January 2002 and April 2014. Inclusion criteria required patients having 1 AED and being 18 years of age. Patients were grouped into the following categories based on AED mechanism of action: Sodium channel blockers (SCB), Gamma-aminobutyric acid analogs (G), Synaptic vesicle protein 2A binding (SV2), Multiple mechanism (MM), and Others. Outcomes were defined as: Switch (at least one recorded AED switch), Discontinuation (at least one recorded AED discontinuation), Discontinuation/switch (at least one recorded discontinuation, and at least one recorded switch), and Other (no record of either a discontinuation or switch). Discontinuation and switch patterns were compared across patient groups using Chi-square-tests. Continuous data were expressed as mean, standard deviation, median and compared using the Kruskal-Wallis test between overall groups.

Results: A total of 1,263 patients with a mean (SD) age of 42.3 (17.3) years were included in the analysis; Fifty-two percent of patients were female; 11% were Caucasian; and 56% visited a neurologist. The majority of patients (994, 78.7%) had one specialty visit during the observation period. Patients were distributed across the AED groups as follows: SCB: 408 (32.4%); G: 111 (8.8%); SV2: 235 (18.6%); MM: 275 (21.8%); Others: 234 (18.4%). Overall, 5.8% of patients switched, 11.6% discontinued, 1.3% discontinued/switched, and 81.3% had no evidence of switch/discontinuation. No statistically significant differences were seen among the AED groups

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regarding the proportion switching medications (One switch: SCB 7.1%; G 7.2%; SV2 4.7%; MM 6.5%; Others 6.0%; Two switches: SCB 1.5%, G 0.9%; SV2 0.9%; MM 0.7%; Others 0%) ($p=0.59$). Approximately 13% of patients discontinued their treatment ($p=0.27$). No statistically significant differences were seen among the AED groups regarding the proportion with discontinuations (One discontinuation: SCB 11.3%; G 7.2%; SV2 10.2%; MM 12.7%; Others 10.7%. Two treatment discontinuations ranged from 0.4%-2.7% (SCB: 2.5%; G: 2.7%; SV2: 1.3%; MM: 1.8%; Others: 0.4%) ($p=0.74$)).

Conclusion: In this real-world study of outpatient medical transcripts of patients with epilepsy from multiple specialties, approximately one in five patients switched or discontinued treatments. Neither treatment switch nor discontinuation patterns were associated with AED class. These results underscore the need for access to a wide variety of treatment options for patients with epilepsy.

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Professional Poster Abstract

Board#-Day
39-T

Category: Preceptor Skills

Title: Factors influencing the preceptors performance for hospital pharmacy practice experiences

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Purpose: The need for high-quality experiential education program and qualified preceptors has increased since the reorganized six-year pharmacy school system was adopted in Korea. Among various factors, preceptors role is essential to establish good hospital pharmacy practice experiences (HPPEs). This study was done to identify factors associated with the performance of the preceptors in HPPE programs. Secondary objectives included suggestion for the ways to more effectively manage and improve the practice program.

Methods: An online survey was sent to 113 hospital pharmacy preceptors belong to eight teaching hospitals affiliated to one medical center. The survey was composed of 4 categories; 1) overall evaluation of HPPEs (the compliance of the HPPEs program, the adequacy of education contents, and the adequacy of the number of preceptors), 2) the role as a preceptor (a role model for students, application theory to pharmacy practice, and a practice program development), 3) the changes during precepting performance (personal and environmental), 4) factors influencing the precepting performance (positive or negative), and 5) self-evaluation on their ability as a preceptor. The response was evaluated using 5-point Likert scale (strongly disagree-disagree-neither agree or disagree-agree-strongly agree). Responses of agree, and strongly agree were considered as positive responses. The results were analyzed according to the preceptors professional work experience in hospital.

Results: A total of 86(76.1%) preceptors responded. For overall evaluation of HPPEs, preceptors with longer professional work experience tended to give positive responses to the compliance of the HPPEs program, and the adequacy of education contents ($p<0.05$). Regarding the personal and environmental changes during participating in HPPEs precepting, the positive response rate for leadership improvement and the HPPEs helped to set up a systematic education program were significantly higher in responders with over 10 years of professional experience ($p<0.05$). Most responders with less than 5 year professional experience answered Reimbursement of precepting as positive factor for precepting, where as the most answered factors in the responders with over 10 years of professional experience were positive response of trainee and cooperation of colleagues. Regardless of the professional experience, over 90% of

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all responders answered excessive workload as the primary negative influence factor. For self-evaluation on preceptors ability, the rate of positive response to I have proper education technique for precepting and I have sufficient knowledge on my HPPEs field were significantly different between responders with over 10 years of experience (71.0% and 64.5%, respectively) and those with less than 10 years of experience (16.9% and 27.1%, respectively) ($p < 0.005$).

Conclusion: Considering the fact that all responders perceived their excessive workload as the most negative influential factor, adjustment of preceptors workload and securing the HPPE preceptors are regarded as a priority. From the preceptor perspective, the influential factors of precepting were different among the preceptors according to their professional work experience. Supplementary education and proper reimbursement should be considered for those preceptors with less professional experience.

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40-T

Category: Psychotherapy / Neurology

Title: Time is Brain: A Community Hospital's Decrease in Door-to-Needle Time in Acute Stroke Cases

Primary Author: Maury Otterstetter; **Email:** maury.otterstetter@sclhs.net

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Purpose: The American Heart Association recommends that alteplase be given, in acute ischemic stroke patients, within 60 minutes from the patient entering the emergency room to the beginning of alteplase administration (door-to-needle time). The door-to-needle time at this 400 bed community hospital averaged close to 60 minutes. Therefore, the stroke alert process was evaluated with the goal to improve our door-to-needle time, while maintaining patient safety and appropriately administering alteplase.

Methods: The first step was to evaluate the current stroke alert process in detail. This review process was done with a multidisciplinary team. Using Lean methodology, the team then assessed the process for wasted steps. Based on information found, a new stroke alert procedure was developed and each of the employees that would be involved in the stroke alert process was educated. Team members that are involved in the stroke alert process include the emergency room physician, the neurologist, in person or on the telestroke camera, a nurse, a pharmacist, and often a stroke coordinator. The most significant change in the new procedure is that the pharmacist now mixes the alteplase at the bedside and not in the pharmacy. Furthermore, it was decided that the pharmacists are going to be more involved in getting important patient information for the safe administration of alteplase. Examples of information needed include patient weight, medication history, confirmed blood sugar and blood pressure, and potential contraindications. In addition to educating the pharmacists, a stroke emergency box was made, which has the medication and supplies needed to mix alteplase at the bedside. Lastly, a time-out was added to the process. This time-out confirms that alteplase is to be given, the appropriate dose, and that there are no contraindications to administering alteplase. This time-out is done in the room just prior to administration of alteplase and with the team present including a physician.

Results: After implementing the new stroke alert process, the door-to-needle times decreased from approximately 60 minutes to close to 40 minutes. The median times have consistently been around 40 minutes, which was a 30 percent reduction in door-to-needle times. While

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improvement in door-to-needle time was the primary objective, with adding the time-out procedure, a new safety review now occurs prior to alteplase administration. There have been several occasions door-to-needle times have been less than twenty minutes and recently a new record low of twelve minutes was achieved. Lastly, the hospital participates in the American Heart Association/ American Stroke Associations (AHA/ASA) Get with the Guidelines for Stroke. Because of the improvement in door-to-needle times, Lutheran Medical Center received the stroke honor roll Elite Plus Award which is awarded to centers which have door-to-needle times within 45 minutes in 50 percent of patients treated with alteplase.

Conclusion: The addition of a pharmacist to the stroke team and the ability to mix alteplase at the bedside has resulted in a significant positive impact on door-to-needle times for patients with acute strokes. The pharmacist now also plays a vital role in the stroke alert process by ensuring that no contraindications to alteplase exist and verifying the correct dose of alteplase is administered to the patient. Lastly, even with improved times, a time-out with the team present adds to the safe administration of alteplase.

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41-T

Category: Quality Assurance / Medication Safety

Title: Safe Utilization of Insulin Pens in Long-Term Care

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Purpose: The use of insulin pens in the long-term care setting continues to be controversial. Insulin pens provide several advantages, but due to significant reports of medication errors several organizations have issued alerts to caution users about safety concerns. The primary objective of the survey is to assess the prevalence of insulin pen use and current utilization trends in long-term care.

Methods: To achieve the study objectives a survey was developed based on review of primary literature regarding insulin pen utilization and evaluated by a panel of medication safety experts from a variety of health care settings. The survey was sent electronically to members of National Association Directors of Nursing, American Healthcare Association, and American Association for Long-term Care Nursing. This research was determined to be exempt by the Purdue University Institutional Review Board.

Results: The survey was completed by 193 respondents. Approximately 28% use insulin pens only in their institution, 32% use only insulin vials, and 54% use both insulin pens and vials. The most common reasons for the use of both insulin pens and vials were cost and prescriber preference. The most common reasons for not utilizing pens were cost and safety concerns. Pens were reported to be stored in the same refrigerator as other insulin products (n=123; 88%) and in a medication cart (n=109; 79%) afterwards. More than half of respondents use three patient identifiers on the pen and 34% label with a barcode. Approximately 5% reported that an insulin pen has been used on more than one patient and 43% experienced a needle stick at least once in their institution. Majority of the needle sticks occurred with a vial and syringe not an insulin pen.

Conclusion: Insulin pens, despite safety concerns, are widely being used in the long-term care setting. Health care professionals believe insulin pens are clinically useful and can be used safely in the long-term care setting.

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42-T

Category: Quality Assurance / Medication Safety

Title: Evaluation of Interdisciplinary Variations in Medication Error Classifications in a Community Health-System

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Purpose: An effective medication safety program is able to enact meaningful process changes in response to medication error reports. As such, it is reliant upon the establishment of a robust interdisciplinary reporting system that generates consistent data for trending and analysis. Potential variations in how different individuals classify errors may have a negative impact on the hospitals ability to target at-risk processes based on error trends and types. Medication errors are commonly reported by pharmacists and nurses. Category classification and assignment of severity is often done by the reporting individual or the charge nurse/pharmacist who receives the report. In a system with strong agreement amongst reporters, medication error data can be reliably trended without the need for oversight and re-classification by a single individual. The purpose of this evaluation was to determine the level of interdisciplinary agreement regarding the selection of medication error categories and severity ratings.

Methods: Surveys were distributed to a random sampling of bedside nurses, charge nurses, and pharmacists as part of an error reporting evaluation conducted by the Medication Safety Committee. Participants were asked to designate an error category and select a severity rating for 5 medication error scenarios. The results were analyzed to determine how likely respondents were to agree on the category and severity rating for each scenario. The scenarios were designed to be complex and survey responses were not evaluated for correctness against a single-rater standard. Levels of agreement for categorization and for severity rating were determined based on the percent of respondents who chose a single category and severity rating. Strong agreement was designated when 75-100% of respondents chose the same category or severity, moderate agreement was indicated by 50-74%, minor agreement by 25-49%, and minimal agreement when < 25% of respondents selected the same category or severity.

Results: Forty-seven surveys were returned from bedside RNs (n=13), charge RNs (n=14), and pharmacists (n=20). Moderate agreement was demonstrated by respondents regarding the level of severity for 4/5 scenarios and only minor agreement for the remaining scenario. With regards to error category, strong agreement was achieved by respondents for 1/5 scenarios, moderate agreement for 2/5 scenarios, and minor agreement for 2/5 scenarios. When

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evaluated by discipline, nurses were less likely to agree with each other on severity ratings when compared to pharmacists. Bedside and charge nurses achieved only minor agreement for the severity of 3/5 scenarios and moderate agreement for 2/5 scenarios. Pharmacists achieved strong agreement on the severity of 2/5 scenarios and moderate agreement on the remaining 3/5 scenarios. The levels of agreement were higher within each discipline for error category classification. Pharmacists and RNs had strong agreement for 4/5 and 2/5 scenario categories, respectively.

Conclusion: This survey demonstrated that there are notable variations in how nurses and pharmacists view and classify medication error scenarios. The lack of consensus amongst various caregivers who report medication errors suggests that consistent data that can be used for trending is more likely to be obtained when the error categorization and severity ratings are assigned by one primary individual rather than allowing this information to be determined solely by the reporter.

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Category: Quality Assurance / Medication Safety

Title: Quantifying and characterising prescribing error on admission and during admission to an acute hospital

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Purpose: Prescribing errors are common and can contribute to in-patient morbidity and mortality. A large study in the United Kingdom (EQUIP (1)) reported an overall prescribing error rate of 8.9% in hospital in-patients. Irish data on prescribing error rate has not previously been reported. This study aimed to: Determine the prescribing error rate (a) on admission, (b) per new prescription and (c) per rewritten drug for in-patients treated under adult medical, surgical and psychiatric services and for paediatric inpatients. Characterise prescribing errors on admission and in new inpatient prescriptions. Validate the potential severity classification by independent review by 4 assessors.

Methods: Clinical pharmacists determined the pre-admission medication list (PAML) according to a validated model(2). Prescribing error rate on admission was the number of discrepancies between the PAML and currently prescribed medication, as a percentage of total medications on the PAML. The error rates for new in-patient prescriptions and rewritten drug chart prescriptions were the number of errors identified as a percentage of the total medications reviewed. For a one week period, all clinical pharmacists recorded the characteristics of each error identified (stage, potential severity, error type and drug type, based on the EQUIP(1) study categories). A validation panel of two clinicians and two pharmacists independently assigned a potential severity rating to each prescribing error and inter-rater reliability Kappa scores were calculated.

Results: Error rate Errors were recorded for a mean of 22.6% of admission prescriptions in adult medical/surgical patients, 18.2% in psychiatry patients and 11.1% in paediatric patients. Mean in-patient prescribing error rates of 7.7% (adult medical/surgical), 3.2% (psychiatry) and 0.8% (paediatrics) were recorded. Mean prescribing error rates on rewritten drug charts of 3.5% (adult) and 3.3% (psychiatry) were recorded. Changes in error rate are tracked over time. Error types - Omission and wrong dose were the most common categories, accounting for 89% of admission prescribing errors and 57.4% of in-patient prescribing errors. Drug class The most frequent drug class errors on admission were central nervous system medicines at 32.4% and 29% of inpatient prescribing errors involved cardiovascular medicines. Potential severity -

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Clinical pharmacists characterised 60.9% of prescribing errors on admission and 66.4% on new in-patient prescriptions as serious or significant. The validation panel characterised 69.5% on admission and 78.4% as serious or significant. Agreement between the clinical pharmacist and validation panel potential severity classification was fair (Kappa = 0.37) and agreement between members of the validation panel moderate (Kappa = 0.53).

Conclusion: Prescribing errors are common and pose a risk to patient safety, with the majority of errors rated as having significant potential to cause patient harm. This study demonstrates the positive impact the pharmacist can have by identifying prescribing errors through medicines reconciliation and ongoing drug chart review during an inpatient stay. A minimally resource-intensive method of tracking prescribing error rates over time is presented. This measure may have potential to be used as an indicator to track progress in improving prescribing practices. References: 1. Dornan T, Ashcroft D, Heathfield H, et al. An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study. Final report to the General Medical Council. 2009.

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Category: Quality Assurance / Medication Safety

Title: Improving antibiotic prescribing with "bugs and drugs" education tool/model

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Purpose: Proper selection of antibiotics for a suspected infection is a necessary skill acquired during a family medicine resident's training. Medical resident education was identified as a needed part of the inpatient curriculum of the family medicine residency program. A lecture was developed to foster rational prescribing habits regarding empiric antibiotic selection. This study was undertaken in order to assess the residents' perceived preparedness, before and after the lecture, to correctly/rationally prescribe empiric antibiotics for a suspected infection.

Methods: The university institutional review board approved this study. The family medicine faculty pharmacist developed and delivered a 1.5-hour "bugs and drugs" lecture, which incorporated active learning, to each postgraduate year-one (PGY1) medical resident during their inpatient medicine rotation. A six-page lecture outline, with objectives, was provided to each resident for taking notes and utilization as a reference/resource during the medicine rotation. Two surveys were administered. The first survey was administered prior to the lecture and the second after the lecture. The pre-lecture survey assessed current, individual level of understanding of specific lecture content areas including preliminary microbiology results, bacteria as it relates to the source of infection, spectrum of activity of antibacterial drugs, meaningful use of the hospital antibiogram, and ability to correctly prescribe empiric antibiotics for a suspected infection. The results of the two surveys were compared.

Results: In the initial phase of the experiment, one class of six PGY1 residents participated in the study. One hundred percent successfully completed the pre- and post-survey from July 2014 to January 2015. While all questions on each of the surveys were answered, few additional comments were provided, as requested at the end of each pre- and post-survey.

Conclusion: Residents receiving a "bugs and drugs" lecture showed an increase in the perception of their preparedness to prescribe rational empiric antibiotics for a suspected infection. The sample size of the study thus far represents the initial phase of the experiment, and further data collection is necessary for statistical analysis.

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Category: Quality Assurance / Medication Safety

Title: Consistent feedback and education has improved accurate allergy documentation

Primary Author: Kathleen Moorman; **Email:** kathleen.moorman@ahss.org

Purpose: Accurate allergy documentation is critical to patient safety and is an important component of safe medication practice. Drug Drug interactions account for approximately 3 to 5 percent of all adverse drug reactions. Adverse drug reactions cost between \$30 to \$130 billion dollars annually and account for 20 percent of the injuries occurring in hospitals. These reactions can double the length of stay and cost of hospitalization.

Methods: On a monthly basis, allergy documentation is reviewed. Issues such as free text allergies or miscoded allergies are presented to Pharmacy and Therapeutics Committee, Physician division meetings and Patient Safety Meetings. Examples of near misses are presented and discussed. Feedback from the hospital and medical staff identified the need for education to the front line staff on how to document food, drug and environmental allergies. Front line staff identified the complexity of the documentation process and inability to understand the terms used in documenting allergies as major barriers. Pharmacy worked with Information Technology, nursing and the medical staff to simplify the process and define the terms such as allergy, side effect, and idiosyncratic reactions. Simplifying the documentation of the reaction process and reinforcing the purpose of patient safety improved the accuracy of documentation. Walking rounds with the staff, discussing allergy issues in patient care rounds and at physician meetings improved awareness and documentation compliance.

Results: Over a fifteen month period, pharmacy reported near misses related to free text allergy documentation and incomplete allergy information. This constant feedback to the nurses, physicians and other members of the hospital staff raised awareness of the need to document allergy information correctly and consistently. Simplifying the process and clarifying the terms led to more consistent documentation. Results were shared on a monthly basis with the hospital staff and medical staff. Physicians supported this project as an improvement in patient safety. They were encouraged to review allergy information and request clarification from the patient or the staff recording the information. Enhancements to the electronic medical record allergy documentation tool were made at the corporate level based on feedback from our organizations streamlined documentation process. As a result of this consistent education, correct allergy documentation improved by 40 percent and correct allergic reaction documentation improved by 30 percent.

Conclusion: Consistent feedback and education on allergy documentation, simplification of the process, and education to the front line staff and how to enter allergy information correctly

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improved allergy documentation. Improving accurate documentation of allergies and reactions in the electronic medical record improves the safety net for our patients. Correct information stays with the patient from hospital visit to hospital visit.

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Category: Quality Assurance / Medication Safety

Title: Barcode scanning improves medication safety and staff satisfaction

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Purpose: Medication errors adversely affect patient care by increasing morbidity, mortality, and overall cost of healthcare. Medication packaging, storage, and distribution processes contribute significantly to medication error problems. Automated dispensing machine (ADM) refill errors have also been identified as significant contributors of medication errors in the distribution process. This study was designed to evaluate the role of barcode technology in reducing medication errors due to inaccuracies in refilling ADMs. Improving inventory management accuracy, increasing operational efficiency, and improving technician satisfaction was also studied.

Methods: A barcode scanning upon refill protocol was implemented at Virginia Hospital Center to attempt to address ADM refill errors. A 14 month medication error report was analyzed to compare the medication error rates before and after the scanning process was implemented. The accuracy analysis was carried out by using a trend chart and a paired t-test to compare the rate of medication errors before and after implementation. A 5 point likert-type questionnaire was administered to pharmacy technicians to obtain their opinions on the barcode technology refill process. The questionnaire addressed accuracy, efficiency, refill time, and overall satisfaction with the process. The likert scale responses were combined to create 3 categories: Disapproval (1 and 2), Neutral (3), and Approval (4 and 5). A two-tailed T-Test with Alpha of 0.05 was employed to determine the degree of significance among the responses. The population average used for comparison was a neutral score of 3. A single sample T-Test was used to evaluate individual responses.

Results: The total number of refill errors reported over 14 months was 73. The average refill errors per month before, during, and after the scanning implementation were 6.7, 4, and 0.5 respectively. An increased refill error rate was observed before the implementation period. The refill error rate decreased during the implementation period. Only one refill error was reported after the implementation period. This error was attributed to a return process activity rather than a refill process activity. Fifteen pharmacy technicians participated in the survey. One

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hundred percent of the respondents agreed that the scanning system improved accuracy at a significant level (p less than 0.05). Eighty percent of the respondents agreed that the scanning system improved efficiency at a significant level (p less than 0.05). Forty-seven percent of the respondents agreed and 40 percent of respondents disagreed that the scanning system decreased refill time, however this difference was not statistically significant. Seventy-three percent agreed that the scanning system improved their overall satisfaction with the refill process. Twenty percent of respondents disagreed that the scanning process improved their overall satisfaction with the refill process. Less than 7 percent did not agree or disagree that the scanning process improved their overall satisfaction with the refill process.

Conclusion: Implementation of barcode scanning upon refill at the ADM altered an upward trend of refill errors and resulted in a significant decrease in overall refill error rate. The pharmacy technicians perceived that the scanning on refill process increased accuracy, efficacy, and overall satisfaction with the refill process. The process did not increase nor decrease the time it takes to refill ADMs. One medication error occurred from a return process activity. Potential enhancements to ADM barcode scanning may include scanning medications upon return to ADMs.

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Category: Quality Assurance / Medication Safety

Title: Optimizing controlled substance area workflow to improve controlled substance diversion surveillance at a tertiary care hospital within a health care network

Primary Author: Katelyn Pontore; **Email:** kpontore@mix.wvu.edu

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Purpose: In 2012, the Mayo Clinic Proceedings released Diversion of Drugs Within Health Care Facilities, a Multiple-Victim Crime: Patterns of Diversion, Scope, Consequences, Detection, and Prevention. The problems identified in the article are being investigated at Allegheny General Hospital to improve controlled substance surveillance and prevent diversion through workflow optimization. Diversion is not a victimless crime. Addicted health care workers are a danger to their patients, co-workers, employers, and themselves. The primary goal is mitigating risks of diversion while optimizing workflow to ensure safety of all stakeholders and prevention of substandard patient care.

Methods: Current controlled substance practices will be investigated and evaluated by direct observation, audits, and reporting. Implementation of process and work flow enhancement will occur after initial investigation of the current situation. Institutional Review Board approval will be obtained prior to data collection. A retrospective review of the controlled substance manifest verses quantities received and added to inventory audit will be used to identify discrepancies and establish a baseline for pharmacy controlled substance area actions during a six month period. The following data will be collected and assessed on a prospective basis: two plus standard deviation controlled substance transactions for similar nursing staff, and discrepancies not resolved within twenty-four hours. All data will be de-identified to maintain confidentiality.

Results: A streamlined controlled substance workflow was implemented in order to prevent diversion and improve surveillance.

Conclusion: It is anticipated that this project will demonstrate a pharmacist-based role for prevention of controlled substance diversion and medication safety.

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Category: Quality Assurance / Medication Safety

Title: Optimizing smart pump utilization and adherence by implementation of a pharmacist-led continuous quality improvement program

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Purpose: Demonstrate increased use and adherence with smart pump parameters and reduction of nuisance alerts through implementation of a monthly review of smart pump data by clinical pharmacists.

Methods: Two clinical pharmacists perform a monthly review of smart pump data which includes individual alerts and adherence to safety parameters/limits established per medication. Additional suggestions for smart pump changes are received via medication safety rounds and floor nurses or pharmacists. Review of current drug information is completed by the pharmacist to support any change to dose, duration, or concentration limits. All recommended smart pump changes are approved at the Medication Safety Committee. Education regarding use and importance of utilizing the smart pumps in terms of patient safety was completed during the yearly nursing education marathon and at medication safety rounds. Utilization and adherence to the safety parameters of the smart pumps was discussed monthly at the Medication Safety Committee. Data were trended from reports provided by biomedical engineering in order to assess 1) use of smart pumps for infusing fluids and medications; 2) adherence with established safety parameters; and 3) rate of pump programming alerts.

Results: A ten month period of monthly reports were reviewed from March 2014 to January 2015. The total number of infusions utilizing the smart pump increased over time by 6,890 per month (March 2014 = 19,723 vs. January 2015 = 26,613), while the number of total orders remained stable. Adherence to the safety parameters increased by 8.6% (March 2014 = 75.2% vs. January 2015 = 83.8%). The pharmacists monthly review of nuisance alerts decreased the total rate of alerts fired by 3.39% (March 2014 = 8.01% vs. January 2015 = 4.62%).

Conclusion: Implementation of a monthly smart pump data review by clinical pharmacists improves utilization of smart pump technology, leading to increased patient safety in terms of intravenous drug administration.

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Category: Quality Assurance / Medication Safety

Title: Innovative use of duplicate prescription data to improve patient safety and efficiency within a mail order pharmacy

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Purpose: The Department of Veterans Affairs (VA) provides comprehensive medical services to our nations Veterans. Veterans can be seen by multiple providers at multiple VA Medical Centers (VAMCs). The majority of providers written prescriptions are then transmitted to one of seven Consolidated Mail Outpatient Pharmacies (CMOPs) across the country. Because Veterans are able to see multiple providers at multiple facilities, there is the potential for the inadvertent transmission of duplicate prescriptions. Prior to the implementation of this project, there was no way to check for duplicate prescriptions filled by any of the CMOPs. The purpose of this project was to create a way to assess and prevent inadvertent duplicate prescriptions in order to reduce the risk of medication errors.

Methods: This project originated at the local Southwest CMOP level, but quickly encompassed all seven CMOPs to engage data on a national level. To achieve the goal of this project, a Southwest CMOP data management pharmacist designed a Structured Query Language (SQL) query to examine all prescriptions sent by the VAMCs to the national CMOP system. Duplicate prescriptions were identified as those for the same patient and same drug, but for a different VAMC. The results of the query are used to generate a weekly report of duplicate prescriptions, which is analyzed on the first working day of each week. The weekly report finds duplicate prescriptions filled within the CMOP system during the previous week and alerts the VAMCs to follow up with the patient or the other VAMCs. A monthly report is also generated from this data, counting the number of duplicate prescriptions filled per week during the previous month. The report breaks the data out by each CMOP. The technician running the monthly report then sends the results to CMOP management nationwide. To date, Southwest CMOP has tracked changes in the number of duplicate prescriptions for over 22 months.

Results: A baseline analysis of 9,694,863 prescriptions in March 2013 showed that an average of 722 prescriptions per day filled across the CMOP system were duplicates. By December 2014, the average number of duplicate prescriptions filled per day decreased to 158, a 78 percent decrease. Each CMOP monitors duplicate prescriptions to cancel back to the medical centers.

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The weekly duplicate report for VAMC fills allows pharmacists to act quickly to prevent adverse patient outcomes.

Conclusion: Implementation of these reports increased the number of cancels for duplicate prescriptions sent to the CMOP system by the VAMCs. It has also reduced the number of duplicate prescriptions sent to the Veterans. The report has also offered a new avenue for collaboration between CMOP and VAMC pharmacists. Through this quality improvement process, CMOP is able to play a more active role in promoting patient safety and improving mail order system efficiency.

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Category: Quality Assurance / Medication Safety

Title: Optimization of bar code medication administration (BCMA) at a tertiary academic medical center

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Purpose: The last ASHP national survey on pharmacy practice in hospital settings (2012) stated that 65.5% of hospitals use bar code medication administration (BCMA) to enhance safety practices during medication administration. The University of Chicago Medical Center (UCMC) implemented BCMA in June 2014 in order to improve the safety of medication administration. Following implementation, several strategies were identified to optimize the BCMA process. The purpose of this project is to describe the best practices that were identified and implemented by UCMC to enhance the safety benefits of BCMA technology.

Methods: An interdisciplinary team was created to support planning and implementation of BCMA at a tertiary academic medical center. A comprehensive data analysis program was developed to support identification and implementation of best practices including compliance and near miss alert report review, direct observation of medication administration pre- and post- BCMA implementation, literature evaluation, and monitoring of safety event reports.

Results: A total of five best practices were identified during the implementation of BCMA at UCMC. These best practices include: development of near miss alert review methodology; direct observation of medication administration pre- and post-BCMA implementation to identify the impact on safety and workarounds; development of standards for linking equivalent medication records for scanning efficiency; implementation of an off-schedule medication administration alert; and educating end- users regarding the limitations of BCMA to prevent over-reliance on technology. Finally, a best practice that was identified and is currently being implemented is limiting the number of bar codes that the nurse has available to scan to force scanning of the manufacturer barcode.

Conclusion: Use of technology in the clinical setting requires continual maintenance. A thorough data analysis program alongside continuous process assessment and improvements helped to develop best practice recommendations for optimizing BCMA technology at UCMC.

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Category: Quality Assurance / Medication Safety

Title: Optimizing glycemic control in hospitalized children with diabetes

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Purpose: Designing and implementing a process for the use of insulin pumps in hospitalized settings can help optimize glycemic control for children with diabetes.

Methods: Insulin pumps are primarily intended for out-patient management of diabetes. Although a variety of guidelines had been created to address their use during hospitalization, success had been hampered by device complexity, limited staff encounters, and inadequate training. To address these barriers, we created a multidisciplinary taskforce to review and standardized inpatient use of insulin pumps to a single device. The taskforce designed policies, procedures, education, and learning tools utilizing human factors engineering principles to improve the reliability of insulin pump ordering, dispensing, programming, and administration.

Results: Checklists with step-by-step visual aids and education modules were created for pump programming, filling, and double-checking. In addition, an electronic ordering system was fashioned to aid insulin calculations, programming warnings, and to produce a medication order that provides the desired settings in the same fashion in which the information is entered into the insulin pump.

Conclusion: The incorporation of safety practices into the workflow of a single standardized insulin pump for hospitalized patients minimizes errors and improves staff competency, helping achieve optimal glycemic control in children with diabetes.

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Category: Quality Assurance / Medication Safety

Title: Parenteral product error detection before and after implementation of intravenous workflow management technology

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Purpose: The aim of this study was to assess the difference in pharmacy error detection when using a traditional manual preparation process (baseline period) versus a more automated, electronic IV workflow management system (post-implementation period) for parenteral medications. Our hypothesis was that the ability to detect errors during the IV preparation process prior to dispensing to the patient would increase with the use of an automated, electronic IV workflow management system.

Methods: This retrospective, observational study included IV preparations made in ambulatory care and hospital infusion pharmacies within the University of Michigan Health System. Baseline error data were recorded by pharmacists or technicians using a standard data collection form over a four-day time period before implementation of the IV workflow management technology. These data were compared to electronically collected data for 48 weeks following implementation of the IV workflow management system. An error was defined as a deviation from the specifications on the patient specific label or the policy and procedures for IV/sterile product preparation. The errors identified before and after implementation were independently and retrospectively reviewed and categorized into 13 different error types by two pharmacists. Discrepancies between pharmacists categorization of error type were discussed and resolved via consensus.

Results: The ability to detect an error during the IV preparation process was 1.44% (22/1,530) during the baseline period and 1.94% (1,742/89,917) during the post implementation period ($p=0.19$). Of 22 errors detected during the baseline period, the wrong drug amount and wrong base solution represented 36% and 23% of the errors, respectively. Post-implementation, a total of 1742 errors were detected. Errors detected by barcode scanning technology (i.e., wrong medication, wrong diluent, wrong drug concentration, and medication expired) represented 59% of the total errors identified and pharmacist check using serial images of the compounding process identified the remaining 41% of the errors. There was an increase in the number of wrong drug errors identified post implementation when compared to baseline (44% versus

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36%). Post implementation there was a decrease by month in the number of bar code scanning errors observed. Some of this decrease can be attributed to corrections and additions to the IV workflow management library and the staff learning curve. The number of pharmacy dispensing errors which were reported via the traditional point-of-care voluntary medication error reporting system were similar for the two time periods (15 before implementation versus 12 after implementation, $p=0.54$). The IV workflow management system introduced new, technology-associated workflow errors that could not occur with the baseline process, including missing pictures and poor picture quality, but this process also enabled pharmacists to determine whether or not the proper amount of drug was used, something that was not able to be detected using the baseline pull-back checking process.

Conclusion: The implementation of an IV workflow management technology was able to detect a greater percentage of errors during the sterile product preparation process, although this increase was not statistically significant. The use of the images to capture key steps in the preparation process post implementation enabled pharmacists to detect inaccurate fluid measurements prospectively, which may have previously been undetected using the traditional IV checking methods. Barcode scanning technology within a workflow management system during the IV preparation process may improve accuracy, reduce the risk of undetected errors and enhance patient safety.