variables and survey responses exist. Responses to questions assessing the reasons why patients engage in unsafe behaviors shall be used to direct future educational interventions.

27-T

Category: Quality Assurance / Medication Safety

Title: Reduction of missing medications through interdisciplinary collaboration, technology, and lean management

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Purpose: Improvement of missing medication is one of the pharmacy departments performance indicators. Missing medications are defined, as medications that have been ordered for a patient and are unavailable or not located by the nurse caring for the patient at the scheduled administration time. Failure to administer a medication on time may impact on patient care and increase direct and indirect costs to the health care system. The study was conducted to determine if collaboration between the nursing and pharmacy departments, combined with implementation of medication tracking technology and utilization of Lean Daily Management (LDM) principles can improve the incidence reported missing medications at our institution.

Methods: From April to September 2013, various initiatives were implemented to reduce missing medications. In April, missing medications were reported at two nursing units LDM boards. First, pharmacy implemented use of the medication tracking technology (MedEx). Pharmacy and nursing personnel were granted access to utilize the technology in the dispensing and delivery process. Second, action plans, following a Kaizen event, utilizing LDM Principles, 5 S methods pharmacy space and medication rooms at nursing units and Standard work - standardization of delivery and storage were implemented. Additionally, 5 S methods and standardization implemented in all patient care units. Two additional nursing units included missing medications on their LDM measurement. These units and pharmacy formed a task force utilizing 5 why methodology for continued improvement. The analysis included missing medication requests sent to pharmacy by nursing via the Meditech system from March 2013 to December 2013. Primary outcome measure is change in average daily number of missing medications requests. Secondary outcome measures include 1) the effect of the Kaizen event for nursing units who participated, and 2) missing medication requests per shift.

Results: At the time of LDM was initiated, overall mean daily missing medications requests were 70.05. In June, the medication tracking technology was implemented and over all mean daily missing medications requests were 59.75, a 14.7% reduction, for the period of June to September. In

September, the missing medications Kaizen event was conducted and LDM principles were implemented. Subsequent overall mean daily missing medications requests were 49.67, a 16.9% decline from previous measurement. At the two nursing units with LDM boards and who also participated in the Kaizen event had further reductions compared to all other nursing units (41.8 % vs. 24.2%) In order to determine if there were differences in the volume of missing medication requests per shift, a sample of 7,657 missing medications was reviewed in detail During the 1500 to 2300 shift 3,063 (44%) were requested, during the 0700 to 1500 shift, 2,680 (35%) were requested, and the 2300 to 0700 shift 1,914 (21%) were requested

Conclusion: Each facet of LDM principles, interdisciplinary collaboration and technology led to improvements in the medication distribution and delivery process. Each of these initiatives was able to decrease the amount of missing medications at our facility.

28-T

Category: Quality Assurance / Medication Safety

Title: Improvement in adherence with Centers for Medicare and Medicaid Services medication administration regulation

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Purpose: The Centers for Medicaid and Medicare Services (CMS) established a regulation that time sensitive medications should be administered within 30 minutes of their scheduled time. Non-time critical medications should be administered within 1-2 hours per hospital policy. Administration of time critical medications that are greater than 30 minutes of their scheduled time may affect the medications therapeutic effect. Medications that are considered time critical are antibiotics, anticonvulsants, anticoagulants, insulin, immunosuppressive agents, pain medication, and medications prescribed more frequently than every 4 hours. Due to the number of medications involved, it can be difficult for medication administration to be given within their respected time frame. The objective of this study is to evaluate the improvement in adherence to this regulation due to changes in the pharmacy.

Methods: An early-late administration report is reviewed on a weekly basis. This report lists the nursing unit, drug name, scheduled date and time, and administration date and time. Drugs are evaluated to determine if pharmacy changes can improve compliance with the CMS regulation. Pharmacy changes include appropriate timing of medications, changes in the computerized physician order entry system, and pharmacy operation changes.

29-T

Category: Quality Assurance / Medication Safety

Title: Implementation of Multi-disciplinary Medication Safety Rounds

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Purpose: The Medication Safety Committee (MSC) reviews global medication safety issues at our institution. The committee wanted to discuss medication safety practices in individual areas of the hospital by speaking directly to the bedside staff. The goal was to identify areas of improvement for each unit which could apply to the entire health-system. To achieve this goal, we implemented weekly multidisciplinary rounds rotating through all areas of the hospital. The purpose of these rounds were to provide education to staff regarding medication safety concerns, promote medication safety practices, and identify current concerns from the staff and patients.

Methods: A weekly rounding team was created that includes the co-chairs of the MSC (clinical pharmacy manager and nursing director), an informatics pharmacist, and an informatics nurse. Each week a different area of the hospital is identified and the manager of that area is notified the day prior to the medication safety rounds. Rounds last approximately 30 minutes and the goal is to discuss safety topics with at least two nurses and one patient. In lieu of rounds on the Thursday prior to the MSC, the rounding team meets to discuss an action plan for information gathered from the previous three weeks rounds. The action plan is then presented and discussed at the MSC.

Results: None

Conclusion: There have been many significant improvements since the introduction of the medication safety rounds. Examples include: AcuDose optimization, Multi-dose packaging changes, bar-code scanning improvements, smart pump alert reduction, and an increase in education of current medication safety topics.

30-T

Category: Quality Assurance / Medication Safety

Title: Frequency of medication errors in medical prescriptions of emergency area at Mexican public hospital

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Purpose: Patients attention quality depends upon several aspects, among which we encounter medical prescription quality. Medication errors (ME) constitute a risk factor for the presence of adverse effects, being prescription errors among the more frequent ME. Few complete studies had been carried on in Mexico about this topic. In this study, we evaluated the frequency of medication errors in medical prescriptions at emergency area.

Methods: Observational descriptive transverse study to evaluate in-patients prescription sheets attending an adults emergency department of a public second and third level of attention Hospital in eastern Mexico. Sample size was calculated with a confidence level of 95% and 10% bias. ME were recorded in a format designed for this study, evaluating twenty different ME occurring in the prescription phase and one ME related to administration, then these were divided in five categories.

Results: One hundred and forty one prescription sheets were analyzed, at least one ME was found in all of them. Overall, 1,079 ME were identified by this format. Mean ME found in each prescription sheet was 8, with a rank of 1 to 24. Median and mode were 7 per prescription sheet. Most frequently identified errors were: infusion rate omission (24.2 percent), abbreviations in drug name (22 percent), illegible units (11.1 percent), administration omitting of any drug (6.4%), orthographic mistake in the prescription (6 percent), and illegible drug name (5.4 percent).

Conclusion: This study shows that 100 percent of prescription sheets analyzed contain at least one ME. This data is useful and trustworthy about the frequency and class of ME in adult emergency facilities from an open Mexican hospital, which justifies propositions and implementation of improvement techniques to prevent ME, therefore avoiding potential consequences to the patient.

32-T

Category: Quality Assurance / Medication Safety

Title: Frequency and severity drug-drug interactions in medical prescriptions in an emergency department in a Mexican public hospital

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Purpose: Drug-drug interactions (DDI) are defined as the result of the combination of two or more drugs, in which their potency or therapeutic efficacy are modified, most of them are not convenient for the patient. In Mexico, these kind of data are too weak. We realized this project to evaluate the frequency and severity of drug-drug interactions (DDI) in medical prescriptions in an emergency department in a Mexican public hospital.

Methods: Observational descriptive transversal study was carried on. The frequency and severity of DDI in medical prescriptions in adult population were evaluated at Mexican public hospital with second and third attention level. Pharmacotherapy sheet corresponding to patients were attended at consultation and hospitalization areas at emergency department. Medical prescriptions were transcribed to another sheet that was designed specially for this study. Severity of DDI and their possible clinical implications were obtained by Micromedex 2.0 software. Sample size was calculated with a confidence interval of 95 percent and 10 percent of bias.

Results: One hundred forty one medical prescription sheets were analyzed, from which at least one DDI was observed in 29 percent of them. Overall 137 interactions were identified and classified as: contraindication (1%), severe (36%), moderate (50%) and mild (13 percent). Group of drugs identified to be more frequently involved in DDI were non-steroid anti-inflammatories (90/137), H2 receptor antagonist (25/137), and oral anticoagulants (22/137). Possible clinical implications were: electrolyte imbalance (29.4%), gastrointestinal adverse effects (19.3%), elevated bleeding risk (18.5%), cardiovascular system alterations (11.8%), toxicity of central nervous system (5.9%), and miscellaneous (15.1%).

Conclusion: The frequency of DDI found in this study was 29%, which is consistent with reports among other countries. Both, early DDI prevention and identification by databases, and integration of a

pharmacist to the health team might be the key to reduce medication errors, thus diminishing the incidence of adverse reactions to drugs, loss of therapeutic efficacy, unnecessary prolonged length of in-hospital stays, health service costs, among other consequences.

33-T

Category: Quality Assurance / Medication Safety

Title: Implementation of medication safety self assessment (MSSA) at county general hospital Kakamega , Kenya

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Purpose: An effective health system requires safe and appropriate use of medications. However, It has been shown by different studies that medication errors occur in all health care systems when human and system factors interact to produce an unintended and potentially harmful outcome. The objective of the MSSA was to conduct a medication use process assessment using a standardized tool to examine current practices and identify opportunities for improvement.The assessment was conducted at the county General Hospital, Kakamega between April and June 2013.

Methods: The Medication Safety Self Assessment (MSSA) is a proactive rapid diagnostic systems approach of examining the entire medication use process using a standardized tool to compare existing practices against established safe medication practices. We adapted to our local context the Institute of Safe Medication Practices (ISMP) tool with self assessment practices that have successfully been applied in the US, Canada, Spain and Australia. The data collection was done by a multidisciplinary team through focused group discussion with selected hospital staff. This involved rating of the current practices against established safe medication practices in the adapted tool. Analysis was done to establish strengths, weakness and opportunities for improvement.

Results: From the assessment it was inferred that potential areas for improvement are in handling of patient information, access to drug information, medication storage practices, labeling of medications, enhancement of the newly implemented computerized system, staff education, patient education and change of culture to learn from medication errors.

Conclusion: The application of the systems approach was an eye opener to understanding the medication journey at the hospital including the interaction between various actors and processes. A number of challenges can be addressed through increased involvement of pharmacy staff within the hospital.

34-T

Category: Quality Assurance / Medication Safety

Title: Development and implementation of a medication shortage dashboard tool

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Purpose: The increase in the number of medication shortages over the last few years has been an ongoing struggle for all healthcare providers. Common reasons for drug shortages are manufacturing delays, increased demand, raw material shortage, and Food & Drug Administration (FDA) recalls. Keeping up with the changing medication shortage landscape, as well as communicating these changes, can be very challenging for the pharmacy department. Not only does the pharmacy department need to stay current, the physicians and nurses who are the first line of medication selection need to as well. A delay in treatment, due to a shorted medication, can result in a significant risk to patient safety.

Methods: A team was formed to identify a method of communicating medication shortages to the entire clinical healthcare staff of a community hospital. First, gaps in the communication process were identified and a standardized approach to identifying medications that were at risk of becoming short in supply was developed. Next, the team created a mechanism that would both track supply on-hand, and forecast stock-outs. Finally, a dashboard, which housed all relevant medication shortage information, was developed along with a method of distribution to clinical hospital staff. The dashboard included detailed information, in a concise format, that included the following: drug name, strength, form, allocation method, reason for shortage, current supply on-hand, alternative treatment options, original report date, and projected release date. A color code was also provided to display current supply conditions and significance of shortage. The creation of this dashboard was identified as a solution to the communication gap.

Results: The completion of the goals identified by the team led to a robust instrument for identifying and communicating drug shortages. A medication shortage dashboard was developed that improved the following areas: 1) timely identification, 2) tracking supply on-hand, 3) informative data collection, and 4) timely communication of shorted medications. The improved communication led to increased visibility throughout the organization. The medication shortage dashboard became a standing agenda item for several house-wide committees, including Pharmacy and Therapeutics, Medical Executive, Antimicrobial Stewardship, and many nursing-related committees.

Conclusion: The development of a dashboard was a key component of facilitating better communication around medication shortages. Once a dashboard is developed, it can be easily maintained on a weekly, monthly, or quarterly basis and distributed to all stakeholders in a timely manner.

35-T

Category: Quality Assurance / Medication Safety

Title: Incidence of incorrect prescribing of nitrofurantoin formulations and impact on clinical outcomes

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Purpose: Differences in nitrofurantoin dosage forms change the characteristics of the antibiotic and dictate dosing frequencies necessary to achieve therapeutic success. Specifically, nitrofurantoin macrocrystals (Macrodantin) should be dosed every six hours for efficacy, whereas nitrofurantoin monohydrate/macrocrystals (Macrobid) is intended for twice daily administration. Pharmacy staff at the St Vincent Joshua Max Simon Primary Care Center (PCC) in Indianapolis, IN, noted repeated instances of nitrofurantoin dose frequency to dosage form discordance when dispensing. There is a lack of published information about this type of error so the frequency and clinical relevance remain unknown. The purpose of this study was to determine the frequency of nitrofurantoin prescribing errors related to a dose to dosage form mismatch at the PCC, and to analyze the impact of such prescribing errors on the successful treatment of urinary tract infection.

Methods: This institutional review board approved study was a retrospective chart review evaluating nitrofurantoin prescribing patterns of the medical residents and staff at the PCC. A prescribing error was considered to have occurred when there was discordance between prescribed dosage form and dosing frequency. Treatment failure was determined by the need for additional antibiotic treatment in patients with documented nitrofurantoin-sensitive pathogens. Active patients of the Internal Medicine (IM), Family Medicine (FM), Internal Medicine/Family Medicine (IM/FM), or Obstetrics/Gynecology (OB/GYN) residency programs were included if they were prescribed either form of nitrofurantoin between January 2009 and June 2013. Patients were excluded if they were less than 18 years of age, incarcerated, or were receiving a prophylactic dose of nitrofurantoin. The primary outcome was the concordance between prescribed dosage form of nitrofurantoin and dosing frequency. The secondary outcome was number of patients requiring an additional antibiotic to treat the infection. Demographic data regarding the patient's pregnancy status and the prescriber's training discipline were collected to assist in subgroup analysis. Statistical analysis was performed in accordance with the type of variable being analyzed.

Results: An electronic health record query identified 683 prescriptions for nitrofurantoin dosage forms during the study period. Of 460 nitrofurantoin prescriptions that met inclusion criteria, 65 (14.1 percent) contained a dose to dosage form mismatch. Of these, 53 resulted in a potential under dose (81.5

percent) and twelve resulted in a potential overdose (18.5 percent). Eleven of the fifty-three patients who were under dosed (20.8 percent) required repeat antibiotics within 30 days, despite culture results demonstrating bacterial sensitivity to nitrofurantoin. OB/GYN wrote the highest number of nitrofurantoin prescriptions overall (n equals 182), followed by FM (n equals 160), IM (n equals 54), IM/FM (n equals 53), and other (n equals 11). The IM error rate (27.8 percent) was significantly higher than both FM (15 percent) and OB/GYN (9.9 percent) (p equals 0.04 and p equals 0.003 respectively), and was greater than IM/FM (11.3 percent), trending towards statistical significance (p equals 0.05). A total of 191 (41.5 percent) of the 460 prescriptions were prescribed to pregnant patients, including 16 which were written inappropriately. All prescribing errors involving pregnant patients resulted in a potential under dose, with five (31 percent) of these patients requiring an additional course of antibiotics.

Conclusion: Prescribing errors involving dose to dosage form mismatches with nitrofurantoin occur with alarming frequency and may result in treatment failure. Education and system-based changes designed to target this group of errors are important to ensure that patients receive appropriate antibiotic therapy. Pharmacists can play an integral role in assuring correct prescribing of Macrobid or Macrodantin.

36-T

Category: Quality Assurance / Medication Safety

Title: Risk stratification of chemotherapy and hazardous medications: multidisciplinary process for safety

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Purpose: The avoidance of errors throughout the medication-use process for chemotherapy and hazardous medications is an important component of the institution's medication-use safety initiatives. This project was designed to assess the current policies and develop a standard work process with recommendations for differentiated safeguard requirements for specific medication groups/classes based on the potential to cause harm.

Methods: A multidisciplinary task force consisting of pharmacists, nurses and physicians was formed, assessed the pharmacy and nursing chemotherapy policies and analyzed the perceived problems associated with the chemotherapy/hazardous process steps. Root cause analyses of several incidents involving chemotherapy/hazardous medications errors were conducted to further identify contributing factors. Policies restricted the prescribing of chemotherapy/hazardous agents to oncology attending physicians, via a paper chemotherapy ordering process, whom only the oncology pharmacists may verify and the administration of the medication by an Oncology Nursing Society (ONS) chemotherapy/biotherapy trained nurse regardless of the indication, service or location. A conceptual model was developed that categorized medications by cancer and non-cancer indications and the risk level at each step (ordering, consenting, verification, preparation and administration). Effective safeguards were identified based on both the indication and medication risk. An electronic database reference was developed to support the granular details for each chemotherapy/hazardous medication, associated indication and required safeguards. An enterprise policy was developed based on the conceptual model and replaced the previous chemotherapy nursing and pharmacy policies. Computerized physician order entry (CPOE), pharmacy verification and electronic medication administration record (eMAR) functionality was developed that hardwired ordering privileges and reinforced the required safeguards. The enterprise policy, database, and electronic functionality were endorsed by the Pharmacy and Therapeutics (P&T) committee and have been implemented. Post implementation monitoring is ongoing.

Results: A conceptual model was vetted by medical, pharmacy and nursing leaders and endorsed by the P&T committee prior to the development of the enterprise policy and database. The conceptual model differentiated the various standardized safeguards required. The online database detailed over 160 medication/indication combinations with the associated standardized safeguard at each step (ordering, verification/preparation and administration) based on indication and risk. The resulting safeguard standards defined included: ordering privileges for chemotherapy (cancer indication) are restricted to oncology attendings; hazardous medications (non-cancer indication) are restricted to non-oncology attendings. Ordering High Risk medications require a paper order until an approved order set with programmed safeguards is implemented; whereas ordering Low Risk medications is allowed for individual electronic drug item ordering. Pharmacist verification/preparation for High Risk medications is restricted to oncology pharmacists; Low Risk medications allows for licensed pharmacists verification. Administration for all chemotherapy (cancer indication) and high risk hazardous medications requires chemotherapy/biotherapy trained nurse with double check; Low Risk hazardous medications can be performed by a licensed registered nurse with double check. Post implementation feedback from end users identified a few programming discrepancies but overall has resulted in improved ordering and administration workflow and fewer medication errors associated with chemotherapy/hazardous medications reported.

Conclusion: Restrictive safeguards applied to all chemotherapy/hazardous medications can result in unnecessary workflow challenges. Standardized but differentiated safeguards were applied to medications based on the medication indication, medication use process step and risk level. An online database and electronic CPOE and eMAR functionality were utilized to reinforce practitioner compliance. This standardized but differentiated approach was helpful in creating a safe and effective medication use process for chemotherapy and hazardous medications.

37-T

Category: Quality Assurance / Medication Safety

Title: Developing an inpatient insomnia order set: getting back to the basics

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Purpose: Many factors contribute to sleep problems for hospitalized patients, yet little guidance exists for how to manage them. Medications used for sleep are often associated with undesirable effects such as residual sedation and patient falls. Providers in our 329-bed institution prescribed nearly 11,000 orders for over 7,000 patients for insomnia management in 2013. Medications included zolpidem, trazodone, diphenhydramine, and various oral benzodiazepines. Zolpidem is currently included on our general medical admission order set and most surgical and orthopedic order sets. This project was designed to develop an inpatient insomnia order set focusing on nonpharmacological nursing strategies with limited pharmacological options.

Methods: In response to patient fall data presented at the Medication Safety Subcommittee (MSSC), committee members searched for and reviewed treatment guidelines, review articles and established protocols related to the management of inpatient insomnia. Alternatives to zolpidem were also researched. The limited relevant findings were used by a team of two pharmacists, two physicians and the medication safety fellow to draft an Inpatient Sleep Protocol. The protocol and a formulary drug evaluation for zaleplon were presented at and approved by MSSC and the Pharmacy and Therapeutics (P&T) Committee. A hardcopy Insomnia Order Set Doctors Order form was created from the protocol. The form was subsequently approved by the Forms Committee, Nursing Practice Council, and P&T. The order form was then converted to an electronic order set for use with computerized physician order entry.

Results: The Inpatient Sleep Protocol/Insomnia Order Set includes many nonpharmacological nursing sleep promotion strategies that target the reduction of noise, light, interruptions, anxiety, and consumption of food and drink in the evening hours. If the patients sleep problem continues after two overnights of implementing the nonpharmacological nursing sleep promotion strategies, providers are prompted to assess the patient for potentially modifiable risk factors related to insomnia, such as sleep-disturbing medications or conditions. Pharmacological management of insomnia may be initiated if

deemed appropriate by the provider and includes either zaleplon or zolpidem. Providers are guided to the appropriate initial agent based on timing of administration and the appropriate initial dose based on age and gender. The Protocol/Order Set provides alternative recommendations if the initial regimen is ineffective. Patient education is recommended with every pharmacological option.

Conclusion: An inpatient insomnia order set was developed that promotes nonpharmacological sleep strategies prior to initiating pharmacological management.

38-T

Category: Quality Assurance / Medication Safety

Title: Medication safety culture: development of a tool for use in United Kingdom (UK) hospitals

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Purpose: The use of medicines is the most frequent intervention amongst all health care interventions. Medications incidents are the second most commonly reported incident type in UK hospitals. Developing a culture of safe medication use is a key component of improving medication safety outcomes and preventing incidents. A better understanding of safety culture specifically related to medication management is important to improve medication safety. Numerous tools have been developed to measure patient safety culture in healthcare settings. There are currently no known validated tools to measure medication safety culture. We propose to therefore develop a tool to measure medication safety culture.

Methods: University Research Ethics Committee and the hospital Research department approval will be sought. A literature search will identify validated patient safety culture tools available. Tools will be adapted to assess medication safety culture. The questionnaire developed will be reviewed by an interdisciplinary medication safety expert panel, then piloted and converted to an online tool. Participant demographics collected will include age, gender, number of years in the hospital. Medication safety attitudes and perceptions measured will include working environment, team work, management of medication errors, stress recognition and management attitude to medication safety. Medical and dental staff; pharmacists and pharmacy technicians; nursing, midwifery and operating department practitioners in one UK teaching hospital will be surveyed anonymously to maintain confidentiality. The primary endpoints will be the development and psychometric analysis of the medication safety culture tool. The secondary endpoint will be to determine the overall medication safety culture of health professionals involved with prescribing, dispensing, administering and monitoring medication. Descriptive statistics will report respondent demographics. Means, standard deviations and interim correlation matrix will be computed for each item. Cronbach's alpha will be calculated to measure the internal consistency reliability. The construct validity will be determined by confirmatory factor analysis and model fit indices.

39-T

Category: Quality Assurance / Medication Safety

Title: Pyxis count discrepancies: nurse training to reduce discrepancies

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Purpose: Automatic dispensing cabinets (ADC) have improved medication safety and access, but may have unintended consequences. ADC discrepancies are differences between the actual and expected count of a medication. They can result from benign processes or patient safety concerns, and current monitoring reports do not differentiate between the two. The purpose of this investigation was to train nurses to reduce discrepancies resulting from benign processes. Reducing discrepancies from benign processes would allow a report of discrepancies to better identify possible patient safety concerns.

Methods: In this prospective investigation at a large academic medical center a pilot unit was selected for training. Nurses were first educated with an iPad module. Afterward, a new, unique method of hands-on standardized ADC training and just in time training (JiTT) was provided to the nurses. Specific case scenarios were created collaboratively with a nurse masters student to target issues identified by continuous quality improvement that potentially result in a benign ADC discrepancy. Discrepancy data was collected through the ADC central server. The rate of discrepancy creation was compared to a control period on the same unit, just prior to training. An unpaired Students t-test was used for the analysis of discrepancies, and was tested for autocorrelation to validate the results. A satisfaction survey, including respondent demographics, was given immediately after training. Responses were recorded on a Likert scale of 1-5, with 1 being strongly disagree and 5 being strongly agree. Descriptive statistics were used for the satisfaction survey results.

Results: Ninety-four percent of nurses were trained, and 94% of the trained nurses completed the survey. Demographics showed that 75% of nurses were female, with 85% being 31 years or older. About one third (38%) have 1-10 years of nursing experience, while 57% had 11 or more years experience. Self-reported level of ADC expertise was 43% as intermediate and 53% as expert. Survey responses showed a mean score for case scenarios as follows: pertinence to work setting (4.65); efficiency of training (4.63); and appropriate difficulty level (4.57). Survey responses regarding the ADC training machine showed a mean score of: ease of use (4.75); usefulness as a teaching tool (4.75); usefulness for in-depth training

(4.60); and, usefulness for quick content review (4.58). Survey responses regarding the satisfaction with the flip cards had mean responses of: professional appearance (4.53); usefulness (4.15); and, ease of daily use (4.13). All responses ranged from 1-5. The rate of discrepancies per transaction per day decreased from 0.00866 to 0.00744 ($p = 0.368$) after the intervention.

Conclusion: The survey results show an overall high level of satisfaction with the hands-on training method, use of a training Pyxis machine, and the JiTT. While the training was well received, there was not a statistically significant decrease in the rate of discrepancies. This may be explained by the short duration of the study or the high level of self-reported expertise on using the ADC in the pilot unit. Future work will include continued trending of the rate of discrepancies in the pilot unit. If a downward trend continues and becomes significant, this training method may be used as a tool throughout the hospital.

40-T

Category: Quality Assurance / Medication Safety

Title: Syringe pump infusions in the neonatal intensive care unit: optimizing smart pump technology

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Purpose: Intravenous (IV) meds are associated with 54% of potential adverse drug events (ADEs), with errors of administration more likely to reach and harm the patient. Potentially life-threatening IV medication errors occur every 2.6 days. Smart infusion pumps and their dose error reduction software (DERS) can help prevent IV medication errors; however, programming infusions in basic mode bypasses the safety features available on smart pumps. The data the smart pumps automatically record can guide quality improvement and determine the pumps impact on improving patient safety. Lean Six Sigma methods provide a framework for evaluating the safe and effective use of smart pump infusion technology using the DMAIC (Define, Measure, Analyze, Improve, Control) cycle. Using the DMAIC cycle we sought to improve the safe use of smart syringe pumps used to infuse medications in the neonatal intensive care unit (NICU) at a large university hospital.

Methods: Three areas for improvement were defined: safely using the smart infusion pumps with improved rate of programming in DERS; determining medications that lacked library entries; and, presenting and regularly reviewing the data collected during smart pump infusions. We measured our baseline performance using two methods. To describe the use of syringe pumps on the NICU the medical records of all patients with a syringe pump in use during a five day period were reviewed. Analysis of this information showed that 90 infusions were run in basic mode while 125 were run in DERS. Ten unique medications were identified as being infused with programming in basic mode. In addition, a technology satisfaction survey was emailed to all NICU nursing staff. This survey revealed that the top four nursing concerns were: not all medications being available in the library; alarms sounding too frequently; issues with slow or low infusion rates specific to this patient population; and, pump size.

Results: Once the initial investigation was complete, three changes were implemented. First, a committee was formalized and now reviews pump safety data on a monthly basis. Next, nurses on the NICU were educated on the importance of using DERS infusions and were presented with the units compliance rate. Finally, a library update request was made for changing existing medication library entries that frequently encounter programming issues, and to add entries for medications that currently

do not have them. With implementation of the first two changes, we have seen a statistically significant increase in the rate of DERS programming after four months. The results thus far are likely due to increased awareness of the importance of using DERS programming, having access to useful data at the point of patient care, and optimizing the programming settings used for this patient population.

Conclusion: The most important step for ensuring that our results are controlled in the future was establishing a committee with a charter and mission that would support the regular review of pump safety data. This committee also provides the expertise to guide changes in the use of smart pumps hospital wide, through a multidisciplinary constituency. By integrating the views of frontline nursing staff, the concerns of those most affected by the use of this technology are being addressed, along with the systematic review of the pump library medication entries. In the future, the DMAIC cycle used to increase DERS compliance in the NICU will be used in other nursing units and likely will be used for other types of smart infusion pumps. In addition, the committee will continue to review smart infusion pump safety indicators for new patient safety concerns and areas for improvement.

41-T

Category: Quality Assurance / Medication Safety

Title: Optimization of factor product utilization within an academic medical center

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Purpose: Safe and appropriate utilization of coagulation factor products is of significant importance. The existence of multiple factor formulations poses risk for error in addition to increased drug expenditures. Currently within the University of Virginia Health System (UVAHS), guidelines have been developed for various factor products which permit only certain services to order these agents for select indications. A process does not exist, however, to enforce these ordering restrictions. Opportunity also exists for improvement surrounding the dispensing and administration of factor products throughout the institution. Factor products are consistently within the top 10 drugs in expenditure at UVAHS which amounted to $3,000,000 in fiscal year 2013. This spend has continued to grow from $1,500,000 in fiscal year 2012 and is expected to exceed $6,000,000 in fiscal year 2014. The purpose of this project is to implement improved systems surrounding factor product ordering, dispensing, and administration in order to enhance medication safety and streamline utilization.

Methods: This project will not require approval by the Institutional Review Board. This project will consist of three stages impacting various areas of the medication use process, including ordering, dispensing, and administration. The first stage will consist of optimization of the ordering of factor products per institutional guidelines. An educational module will be developed to restrict ordering of these products to approved services only. Following completion of the module, only those approved providers will be granted ordering privileges for factor products in the electronic medical record (EMR). The second stage will require modifications to the dispensing of factor products. Rather than send medication vials to the patient care units where additional manipulation will take place, factor products will be compounded within the sterile environment of the IV room. The final stage will involve the development of multidisciplinary educational resources to provide clarification regarding coagulation disorders and administration of factor products, including proposed dosing regimens. Efficacy of the implemented changes will be assessed through analysis of drug spend, factor product waste, and adherence to guideline restrictions.

43-T

Category: Quality Assurance / Medication Safety

Title: Application of global trigger tool versus voluntary reporting of harm from drug adverse events detection, root cause analysis and prevention

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Purpose: Drug adverse events (AE) in hospitalized patients can increase length of stay, cause morbidity, and rarely even mortality. Voluntary reporting (VR) can be sporadic and foster recurrences. A more systematic approach to AEs is a global trigger tool (GTT), that samples discharged patient, on a monthly bases, for AEs and projects overall harm rate for total patient population. The purpose of this study was to contrast GTT and VR in a tertiary care hospital over a 24 month period for numbers, severity, and rate of harm. Furthermore, the goal was to apply this information and adjust policy to limit or prevent recurrence of problematic areas and to apply the data for the development of specific safety initiatives with a goal to decrease patient harm by 40% over a two year period.

Methods: GTT method briefly involves screening by trained GTT reviewers, consisting of a pharmacist and nurse, of 20 patient charts monthly. The process is limited to a 20 minute review of each, looking for triggers such use of naloxone, glucagon, flumazenil, etc. that can alert screeners to AEs evaluated for harm. These are extrapolated to harm per 1000 patient days of hospitalization as defined by Institute for Healthcare Improvement (IHI). Harm determination is based on the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) formula. Harm severity scales are alphanumeric A-I for GTT vs 1-8 for VR (note A-D, 1-3,respectively represent no harm). In this study GTT was compared to AEs reported via VR over a 24 month period for 2012 through 2013. Each AE was then evaluated for root cause analysis through Institute for Safe Medication Practices (ISMP) Assess-ERR worksheet to assess problematic areas. Subsequently, evaluations of institutional policies were reviewed for changes that could prevent or limit recurrences.

Results: GTT identified AEs in 13.26+/-4.3% of the 20 charts reviewed each month. Over the study period, total AEs of harm for VR was 68 (2.8+/-1.0/month) while GTT identified 80 (3.3+/-1.2/month), p= 0.56. However when extrapolated to harm per 1000 patient days, the mean rate per month for VR was 0.25+/- 0.11, vs 42.45+/-23.61 for GTT. Using GTT trended data 3 AE problem areas were identified for further focus. These were patient over-sedation, opioid administration, and insulin-associated hypoglycemia. These areas were trended for AEs for 2011-2013, from GTT data, and demonstrated harm rates per 1000 patient days of 3.8, 1.2, 4.6, respectively.

Conclusion: Although AE total numbers for GTT and VR were comparable in this study, extrapolated harm per 1000 patient days was vastly different in a magnitude similar in other studies. VR requires staff to dedicate time to AEs at the cost of other patient care issues that are equally important and therefore AEs are not prioritized. GTT provides a more comprehensive and systematic approach that allows institutions to guide patient safety initiatives, which has not been shown to be possible via VR. Following up this system with root cause analysis allows institutions to develop policies that can minimize recurrences and enhance patient safety. Alternatives such as computerized systems and use of dedicated staff for intensive monitoring of AEs are labor-intensive and require greater resources and technical training, that is often not possible for smaller institutions. GTT can be instituted with limited initial training and reasonably short monthly survey times, which can identify problem areas that may continue to be medication safety issues for patients if a systematic approach such as GTT is not utilized.

44-T

Category: Quality Assurance / Medication Safety

Title: Use of a best practice alert to curb inappropriate duplicate pneumococcal vaccinations

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Purpose: In California, state law mandates that hospitals offer pneumococcal vaccines to all patients prior to discharge. To facilitate compliance, the health systems computerized physician order entry (CPOE) incorporates prompts in the discharge order set to remind all providers to vaccinate. The purpose of this project was to determine the prevalence of inappropriate duplicate pneumococcal vaccines at the medical center, implement a plan to decrease the number of duplicate pneumococcal vaccinations, and to evaluate the effectiveness of this process improvement.

Methods: A medication database was reviewed to identify all patients discharged between the dates of April 1, 2011 through August 20, 2012 who had received more than one pneumococcal polysaccharide vaccine (PPSV23) during the defined period of time. Patients were excluded if revaccination was appropriate according to the CDC guidelines. A best practice alert (BPA) was implemented in the beginning of August 2012 to warn the inpatient validating pharmacist and ordering physician to check for inappropriate duplicates when processing new pneumococcal vaccine orders. Specifically, the best practice alert included a link to the immunization record and appeared upon verification for every pneumococcal vaccine order. In addition, an electronic notification was distributed to inpatient pharmacists educating them on which patients should receive duplicate PPSV23. Health system pharmacists were granted the authority to discontinue inappropriate duplicate vaccines without having to contact the prescriber. One year after the best practice alert was implemented; the medication data was reviewed again to determine the number of duplicate pneumococcal vaccines that were discontinued by pharmacists and providers between the dates of August 22, 2012 to August 21, 2013.

Results: There were a total of 185 inappropriate duplicate PPSV23 immunizations that were administered to patients before the best practice alert was implemented. The total cost of inappropriate duplicate immunizations was $21,175.10. There were a total of 905 pneumococcal vaccines that were discontinued between August 22, 2011 and August 21, 2012. The breakdown of discontinuing specialties is as follows: pharmacists 791/905 (87%), medical residents 79/905 (9%), attending 20/905 (2%), physician assistants 6/905 (0.7%), nurses 3/905 (0.3%), nurse practitioners 2/905 (0.2%), midwifes 2/905 (0.2%), medical fellows 2/905 (0.2%). Post best practice alert, there were a total of 7 inappropriate

duplicate pneumococcal immunizations between August 22, 2012 and August 22, 2013. The total cost of inappropriate duplicate immunizations was $801.22. There were a total of 1367 PPSV23 discontinued between August 20, 2012 and August 20, 2013. The breakdown of discontinuing specialties is as follows: pharmacist 1282/1367 (94%), medical resident 58/1367 (4%), attending 14/1367 (1%), medical fellows 5/1367 (0.4%), nurses 3/1367 (0.2%), nurse practitioner 3/1367 (0.2 %), midwife 2/1367 (0.1%). One year after implementing the best practice alert, there was a 96% reduction in number of duplicate PPSV23 given to patients at the medical center and a cost savings of $20,373.88.

Conclusion: The best practice alert was an effective and efficient way to prompt the pharmacists to review the immunization record prior to verification. Including a link to the immunization record may also have helped to increase compliance to CDC pneumococcal vaccination guidelines. Granting pharmacists the authority to discontinue duplicate vaccines may also have aided in increasing compliance with minimal impedance on the pharmacists workflow.

45-T

Category: Quality Assurance / Medication Safety

Title: Trends in antidepressant-related adverse drug events in hospitalized patients from 2001 to 2011 in the U.S.

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Purpose: The rates of adverse drug events (ADEs) are increasing over time mainly due to the aging of the population and the growth in the number of comorbidities and polypharmacy. Depression is a prevalent mental disorder and the 4th leading cause of disability in the world as per the World Health Organization. Use of antidepressants can lead to ADEs. This study aimed to examine changes in incidence of antidepressant-related ADEs (ArADEs) in hospitalizations from 2001 to 2011 among different demographic groups and types of hospitals; and to examine changes in lengths of stay (LOS) and hospital charges in ArADE-related hospitalizations from 2001 to 2011.

Methods: The institutional review board approved this study based on de-identified database. The Health Care Utilization Project database, which covers more than 1000 hospitals in 45 states, was used. Weights of individual inpatient stays provided in the database were used to estimate the national total. ADEs included harm caused by a drug at normal doses, medication errors, and other harms caused by use of a drug. Illicit drug use and cases of intentional harm or self-inflicted injury were excluded. Primary diagnoses of ArADE were considered as an indicator of ADE-caused admissions and secondary diagnoses as a proxy for hospital-acquired ArADEs. ArADEs in different demographic groups were examined including age, race, gender, and rural/urban hospitals. Age was categorized into 0 to 6, 7 to 17, 18 to 64, and 65 years or older. LOS and hospital charges for ArADE-related cases were compared between 2001 and 2011. Chi-square test and t test were used with alpha=0.01.

Results: There were 17,375 and 20,588 ArADE-caused admissions in 2001 and 2011, respectively. There was a 20.4% increase among the group of 18 to 64 and a 68.2% increase among the group of 65 years or older ($p<0.01$) and no significant change in the other age groups. Both gender groups had a similar increase. The mean LOS increased from 2.19 to 2.80 days ($p<0.01$). Mean hospital charges increased from $8,559 to $21,599 ($p<0.01$). There were 24,633 and 22,626 hospital-acquired ArADEs in 2001 and 2011, respectively. There were 67.2% decrease among the groups of 0 to 6, 13.8% increase among the group of 18 to 64 and 76.6% decrease among the group of 65 years or older ($p<0.01$). Both gender

groups had similar decrease. There were 30.8% decrease in rural hospitals and 7.3% decrease in urban hospitals ($p<0.01$). The mean LOS deceased from 4.11 to 3.67 days ($p<0.01$). Mean hospital charges increased from $10,137 to $21,338 ($p<0.01$).

Conclusion: There was an increase in ArADE-caused admissions and a decrease in hospital-acquired ArADEs. The great increase in ArADE-caused admissions among elderly patients should be noted and addressed by practitioners and policy makers. The great increase in hospital charges needs further research.

46-T

Category: Quality Assurance / Medication Safety

Title: Pilot Survey: Global Assessment of the Advancement of Hospital Pharmacy Practice According to the International Pharmaceutical Federation (FIP)'s

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Purpose: A survey to assess an international hospital on their level of hospital pharmacy practice according to the Basel Statements was piloted and validated.

Methods: Basel statements which could be assessed and measured at the hospital level were included in the survey instrument. Constructs were revised after five cognitive interviews with likely participants. The survey instrument was pilot tested in four countries; two high income, a lower middle income, and a low income country. Basel Statement Tiers were developed by investigators to assist hospitals in prioritizing the achievement of Basel Statements. Tiers were validated by the Hospital Section chairs of FIP through a card sorting exercise. Simple agreement was used to characterize inter-rater reliability. Descriptive statistics were used to characterize the responses.

Results: Forty-four survey responses from 36 hospitals were collected. The survey response rate was 29% and took an average of 26 minutes to complete. The overall average agreement of constructs was 83%. The survey characterized how far a hospital was to achieving the Basel Statements with an average achievement rate of 57% (ranging from 30% to 90%). The survey highlighted medication safety challenges facing the pharmacy profession. The results produced a bench marking report for each respondent.

Conclusion: The practice of hospital pharmacy differs within countries. The validation of this survey provides a tool for hospitals to track their Basel Statement progress and benchmark their practice. This survey should be adopted by FIP to disseminate globally and create a global dashboard for hospital practice.

47-T

Category: Quality Assurance / Medication Safety

Title: Effects of visual cues in accuracy of pharmacist product check

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Purpose: Often times, the pharmacy department and its medication dispensing functions are physically segregated from patient care areas. Many tasks associated with dispensing medications are routine procedures that are repeated throughout the day. One important duty for an inpatient pharmacist is to check the accuracy of medication orders that have been filled for patients prior to the medications leaving the pharmacy for delivery to nursing units. Despite diligence and effort, there are inevitably occasional orders that may have been filled incorrectly and escape detection by the checking pharmacist. The purpose of this study is to identify if there is a difference in the accuracy of pharmacists performing a final check of medications when there are images of patients located close to the checking station compared to when there are no patient images posted. The null hypothesis of this study is that the presence of rotating patient photographs near the product checking station will not result in more accurate pharmacist product check and that there will not be a reduction in products with undetected errors leaving the pharmacy.

Methods: Data from this IRB approved study will be collected over a period of ten weeks to identify the rate of undetected errors that are dispensed by the pharmacy. Data collection will consist of counting total number of doses checked (denominator) and total doses with at least one undetected error (numerator). Posting a patient picture or having no picture will be alternated weekly over a ten week study period. Hanging or removal of photos will occur on Friday evenings. Data will be collected Monday through Friday to allow a washout period over the weekend. Data will be collected and recorded on the nursing unit after doses have been checked by a pharmacist and delivered by a technician. The inclusion criteria for this study includes unit dosed or ready to use products dispensed by the pharmacy. Exclusion criteria include doses filled on the weekend, or doses that are not ready to use products. Data from the picture weeks will be compared to no picture weeks using a chi-square test.

Results: Data will be used to calculate a weekly error rate. Descriptive information on undetected errors was also collected, including: the nursing unit where the medication was ordered, the relative

experience level of the pharmacist checking the medication, and the type of error that occurred (eg, wrong drug, expired product, missing auxiliary label, etc.). The rate of undetected errors during weeks with patient photos will be compared to the rate of undetected errors when no photos were hanging to determine if this environmental change had an effect on the pharmacists ability to detect medication errors.

Conclusion: Conclusions will be made available after results have been analyzed.

48-T

Category: Quality Assurance / Medication Safety

Title: Evaluation of the Quality of a Pharmacy Residency Assessment Program

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Purpose: In order to provide quality service, healthcare providers must have the competencies necessary to perform their jobs according to standards. There is a growing emphasis on the demonstration of achieved competency through outcome measures for healthcare professionals as opposed to experience-based training. In this transition towards assessment of competencies, understanding the quality of an assessment method and its criteria plays a key role. The purpose of this study was to evaluate the residency assessment program for pharmacy residency programs at UNC Hospitals and Clinics (UNCH).

Methods: A Competency Assessment Program self-evaluation tool created and validated by Baartman and colleagues 1 was adopted, reviewed, and administered as a web-based self-evaluation tool to pharmacy residents enrolled in the program between 2010 and 2013 (n= 41) and current preceptors (n= 53) at UNCH. The self-evaluation tool is a web-based survey which includes 4 indicators for 12 quality criteria. Survey respondents were also asked to identify the assessment methods utilized during their residency or precepting experience through the residency assessment program at UNCH. Utilizing IMB SPSS version 21, a reliability analysis was performed using Cronbachs alpha, and the survey results were then analyzed using descriptive statistics and non-parametric analytic methods. Baartman and colleagues regarded criteria rated at 65% or higher to be of good quality, ratings between 30% and 64% to be of medium quality, and ratings below 30% to be poor. Results were reviewed by the research team, who then made recommendations on improvement in the assessment program for pharmacy residents at UNCH.

Results: 23 residents and 28 preceptors completed the survey tool, corresponding to a 56.1% and 52.8% response rate, respectively. The mean rating for the Educational Consequences composite (45.25%) was one of the only composite quality criteria that was not above a mean of 65%. The individual indicators for this composite include: the assessment program motivating learners to learn more (44 %), the assessment program not hindering learning of what is desired to be learned (39%), impacting the learning objectives of future learning experiences (49%), and incorporation of feedback on the assessment program being incorporated into future assessments (43%). No quality criteria were rated above 80%. The ranges of each composite ranged from a difference of 58 percentage points to 96

percentage points, indicating high variability in perceptions. There were no differences in perception of the quality of the assessment program between residents and preceptors. Those who had completed residency elsewhere thought the assessment program to be more meaningful and authentic than those who had only experienced residency at UNC. Educational consequences are perceived to be greater for residents who have completed residency only at UNC versus those who have had other experiences

Conclusion: Overall, the residency assessment program at UNCH is perceived to be an effective assessment program by both residents and preceptors at UNCH. The focus of improvement in the residency assessment program should be geared towards educational consequences, and ensuring the assessment motivates learners to learn more, learn what they desire, and incorporates their feedback. Resident assessment should build upon prior experiences.

49-T

Category: Quality Assurance / Medication Safety

Title: Scatter plot methodology in smart infusion pump library refinement to reduce clinically insignificant alerts

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Purpose: Smart infusion pumps are implemented in health systems as an approach to reduce medication administration errors. Development of the smart pump drug library upon implementation to encompass institution-specific dose and rate limits, concentrations, and clinical advisories is a complex process requiring multidisciplinary resources. Over time, refinement of dose limits is critical to reduce clinically inappropriate medication administration alerts succeeding evolving evidence based practice and possible oversight in drug library development. The purpose of this study is to evaluate and refine current smart pump drug library limits using an analytics based approach in an effort to reduce clinically insignificant alerts while maintaining safety.

Methods: A six month override alert analysis report was used to identify the top 20 overridden medications. Each respective medication was graphed using scatter plot methodology to show the number of overrides versus final programmed rate in a given time period with markers for upper and lower drug library limits. If a significant opportunity to reduce the alerted final doses programmed existed, the respective limit was evaluated using institution and evidence based practice and revised if applicable. In order to reduce clinically insignificant alerts without compromising safety, a two year alert summary report was evaluated to identify incidents of alerts that led to edits, which indicates potential programming errors may have occurred. The potential errors were considered when revising drug library limits. A drug library update encompassing revisions to the top 20 overridden medications was performed in December 2013 and 80% of the smart pumps were updated by February 2014. Investigators will generate an alert analysis report to evaluate reduction in alerts.

50-T

Category: Quality Assurance / Medication Safety

Title: Effectiveness of labeling and storage standardization on reducing dispensing errors with solid oral medications with multiple dosage forms

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Purpose: Solid oral medications with multiple dosage forms, such as divalproex sodium delayed release and sprinkles, are frequently confused during the filling phase of the medication-use process. This is one of the most common filling errors detected by pharmacists during checking and by nurses during medication administration according to our internal data. We developed a systematic approach to labeling and storage specifically designed to prevent dispensing errors with these types of medications. We sought to determine the effectiveness of this intervention by comparing voluntarily reported error rates six months pre- and post-intervention.

Methods: We designed a standardized method to label and store solid oral medications with multiple dosage forms. We used the same storage bin used for all other medications in our pediatric pharmacy; however, the bin for these medications also had a lid. The labeling for products in our pharmacy was previously standardized but there was no special process to identify medications with multiple solid oral dosage forms. We created standardized labeling with larger font and bold letters to highlight the dosage form differences with these medications. We also added a warning sticker to the top of the bin lid indicating, warning: multiple solid oral dosage forms. We educated staff on the impending change in storage of these medications throughout the week then implemented the bins altogether on one day. We planned to review voluntarily reported error rates for these types of medications for two specific nursing units that are high utilizers of these types of medications for 6 months pre- and post-intervention.

Results: Initially forty-one medications with multiple solid oral dosage forms were identified as items stocked in our pharmacy. We choose to test our intervention with a subset of these medications, those with overlapping strengths (e.g., divalproex sodium delayed release 250 mg and divalproex sodium extended release 250 mg) and those available as orally disintegrating tablets, which appeared to be the items most commonly involved in dispensing errors from our internal data. Thus we implemented the

new labeling and storage standards for 15 medications that accounted for 89 distinct products. From our online error reporting system, we identified voluntarily reported errors for two specific nursing units involving medications with multiple solid oral dosage forms that occurred 6 months prior to our intervention. Errors identified were classified according to drug, dosage form and error type. Average number of errors per month and per six months was identified. The same data will be compiled for the post-intervention time period, which will conclude in May 2014. Upon review of preliminary data we have seen a dramatic decrease in the number of voluntarily reported errors involving these medications.

Conclusion: There are several drugs with multiple solid oral dosage forms, many of which have overlapping strengths, which can increase the likelihood of mix-ups. Standardization of storage and labeling of medications with multiple solid oral dosage forms appears to have dramatically reduced voluntarily reported dispensing errors involving these products in our pediatric pharmacy. In the absence of more robust forms of prevention (e.g., bar-code enabled dispensing) this intervention appears to be an effective method to reduce dispensing errors with medications with solid oral dosage forms.