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

**Session-Board Number:** 4-001

**Poster Title:** Systematic review of brazilian hospital pharmacy history

**Primary Author:** Lindemberg Costa, Federal University of Bahia, Brazil; **Email:** lindemberg.rn@gmail.com

**Additional Author(s):**
Charleston Pinto
Mariana Melo
Bruna Sampaio

**Purpose:** Describe the history of the Brazilian hospital pharmacy in the 20th century

**Methods:** A systematic search of studies related to the history of the Brazilian hospital pharmacy was carried out using the following databases: MEDLINE (1951-April 2006), EMBASE (1966- May 2017), Pharm-line (1978 to May 2017), International Pharmaceutical Abstracts (1970 - May 2017), Regional Medicine Library - BIREME (1967 to May 2017) and SCOPUS (2003 to May 2017). We included studies on the Brazilian hospital history and pharmacy. The title, abstract or full article has been revised for relevance; Any study not related to the history of the Brazilian hospital pharmacy was excluded. The search mechanisms were based on the use of Descriptors in health sciences (DeCS) and medical subject headings (MeSH), in addition to synonyms and free terms such as "hospital pharmacy", "pharmaceutical", "Brazil" and "hospital". Also included were some search qualifiers such as "history", "teaching" and "legislation". besides the manual search for the primary literature, in the references of articles and secondary, tertiary and gray literature. Articles published in Portuguese, English and / or Spanish were included, describing the history of the hospital pharmacy in Brazil. The exclusion criteria adopted were for articles other than the recommended languages, incomplete articles and / or duplicates. The studies were selected by 2 authors and reviewed by a second collaborator.

**Results:** More than 7 thousand articles were found through the search mechanisms used, many were not related to the history of the hospital pharmacy. Thus, evaluating only title and abstract, 64 studies were pre-selected, but most of these articles did not meet the inclusion requirements, mainly because they did not describe the theme, construction or development of the hospital pharmacy in Brazil. Most were fragments of political facts or short periods of
history. Of these 64 studies, only 5 were included, since they were in the recommended language and met the selection criteria. However, these articles alone do not describe the history since 1940 so far, but they related the history or evolution of the hospital pharmacy in Brazil in some aspect, from its influences to its political context, being necessary a deepening of the thematic. In addition, the articles found more than once, in different databases and search strategies, were excluded by duplicity, a total of 19 articles.

**Conclusion:** this review show there are no articles in the literature that describe the history of the Brazilian hospital pharmacy in all relevant aspects (Technical, Clinical, Politics and social) our profession. Therefore, it is necessary to develop new studies that report the construction of the Brazilian hospital pharmacy, describing its history and its current situation.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-002

Poster Title: Calculating the ROI of clinical pharmacy services: metric-based evaluation of pharmacist interventions in a community teaching hospital using parallel data mining software

Primary Author: Joseph Cruz, Ernest Mario School of Pharmacy at Rutgers, The State University of New Jersey/Englewood Hospital and Medical Center; Email: joseph.cruz@rutgers.edu

Additional Author(s):
Jeffrey Nemeth
GaEun Joung
James Regan

Purpose: Parallel data mining systems and intervention documentation software can help to streamline and facilitate the accurate tracking of the clinical and financial impact of pharmacy services in the hospital setting. Relaying this information to the various stakeholders in an institution using standardized reporting metrics of pharmacist value can aid in the justification of staffing levels, specific positions, and the expansion of new services. This descriptive report details the methods of metric derivation and analysis used to report the value of pharmacy services in a community teaching hospital.

Methods: Aggregate intervention documentation from Sentri7-(R) and Quantifi-(R) was evaluated over a 24 month period (January 2015 - December 2016). Return on investment (ROI) for clinical pharmacy services was calculated using the absolute number of interventions, soft and hard cost savings, and pharmacist-time spent intervening. Data was broken up quarterly to allow for comparison over time. Justification for the time and cost-savings metrics used were based upon actual hard cost savings, the cost of pharmacists' time based on average salary, and the savings associated with adverse drug event (ADE) avoidance due to pharmacist intervention. A timeline of pharmacy service additions, deletions, and modifications was tracked alongside the quarterly ROI calculation to identify trends over time of changing practice patterns within the pharmacy department and institution overall.

Results: The overall ROI for pharmacy services was $10.90:$1 (Quarterly Range: $8.60:$1 - $12.04:$1) during the 24 month study period. The total number of interventions documented during the study period was 42,986 (Quarterly Range: 4910 - 6284). The total hard cost savings
documented during the study period was $610,376 (Quarterly Range: $59,012-113,596). The total soft cost savings documented during the study period was $2,766,119 (Quarterly Range: $304,140 - $407,732). The total time spent on clinical interventions that were documented during the study period was 6,222 hours (Quarterly Range: 677 - 1015 hours). The quarterly fluctuations in ROI identified over the study period were relatively minor and roughly aligned with some notable additions, changes, and deletions of specific pharmacy services and initiatives; these included the presence/absence of a dedicated transitions of care pharmacist, increasing requests for discharge medication counseling among staff, the addition of an extra decentralized pharmacist to a medical/surgical floor, changes in patient volume in specific care areas, and the presence/absence of a dedicated patient assistance pharmacist. Furthermore, we hypothesize that natural changes in intervention patterns among pharmacists due to adaptations in prescribing and monitoring patterns account for some of the changes identified over the two year period.

**Conclusion:** Measurement of pharmacy service metrics in the hospital setting has become increasingly important as more focus is placed on increased quality of care at lower direct institutional costs. These data may be subject to fluctuations from both predictable and unforeseen variables, but standardization of metric systems allow for consistent calculation of ROI and assessment of trends over time. Limitations relating to rates of documentation and methods of assigning time and monetary values to interventions reduce broad applicability of these specific results, though, the implementation of a similar system at another institution would allow for internal benchmarking and subsequent evaluation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-003

Poster Title: Creation of a pharmacy supply chain scorecard to measure performance and identify opportunities for improvement

Primary Author: John Feucht, Summa Health System; Email: feuchtj@summahealth.org

Additional Author(s):
Frances Fu
Melissa Strayer
Martin Ober
Ryan Gardner

Purpose: To explain the steps taken to construct a comprehensive scorecard which can be utilized to explain the factors contributing to or detracting from financial performance to financial and executive leadership. The tool is designed to be fluid so that it can capture the ever changing influences on financial performance in the pharmacy supply chain. The tool not only identifies the major factors which affect the performance, but also contains sections to identify positive areas of performance, as well as, those which require mitigation or rescue strategies. The scorecard is displayed in an attractive “Stop Light” format using red, yellow, and green indicators.

Methods: An interdisciplinary team comprised of finance, performance improvement, and pharmacy leadership was convened to identify, prioritize, and address inflated spend. Pharmacy leadership gathered a year’s worth of drug spend by therapeutic class by month - along with rebate amounts -- from velocity reports generated by the wholesaler software program. Pharmacy reported the monthly drug spend by therapeutic class to finance and performance improvement analysts. Pharmacy also identified and reported any extraordinary circumstances which contributed to variations in normal purchase patterns. Examples include: drug shortages leading to the purchase of more expensive alternative agents or stockpiling of inventory, patients utilizing a larger than normal quantity of stocked product such as blood factors, immunoglobulins, chemotherapy agents, or biotech specialty drugs, as well as, increased usage of non-formulary agents. An automated report was created to efficiently provide monthly inputs on actual spend, target, and trend information. Ratios are reported as dollars spent per WEIPA (Weighted Equivalent Inpatient Admission), which adjusts for the monthly volume and case mix variations of the patient population. Savings erosion was

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
manually calculated as the total unexpected spend -- across all therapeutic classes -- divided by the YTD savings earned; this verifies whether the cumulative savings earned over prior year performance outpaces the unexpected spend increases of the current year.

**Results:** From the spend analysis, the top six focus areas were identified by therapeutic class. Next, the team prioritized those classes for focused improvement work: Chemotherapeutics (43.5% of over-budget spend), General drugs (42.9%), antimicrobials (8.5%), clotting factor drugs (2.5%), anesthesia drugs (1.6%) and vaccines (1%). This data was utilized to develop tactics and projects to obtain or maintain budget compliance. Once the tactical project was completed, another focus area was included in the opportunity section. Additionally, “quick wins” were reported in the Celebrate Section. Any item detracting from performance was assigned to the Mitigate or Rescue tab depending on complexity or percentage of financial impact. The institution changed wholesalers in November of 2016 which disrupted the general ledger code mapping from the wholesaler software to the financial reporting system. This persisted for one quarter so it was moved to the mitigate section. During the measurement period, there were no items identified to require rescue.

**Conclusion:** The scorecard was well received by the executive and financial leadership team and has been adopted by other departments within the organization. Additionally, the scorecard provides pharmacy leadership with a concise snapshot of monthly purchasing activity allowing them to quickly identify areas of focus and opportunities for improvement. Tactical strategies and projects were then developed around these focus areas. These strategic initiatives contributed to a reduction in pharmaceutical costs and a positive budgetary impact for the institution that totaled over six million dollars.
**Submission Category:** Administrative Practice/ Financial Management / Human Resources

**Session-Board Number:** 4-004

**Poster Title:** 340B drug pricing program maintenance: methods used to identify charge drug master changes and billing discrepancies at a disproportionate share hospital

**Primary Author:** Gabriel Guerra, NYU Langone Medical Center; **Email:** gabiely.guerra@nyumc.org

**Additional Author (s):**
Kenny Yu  
Kenny Eng  
Mark Capuano

**Purpose:** The 340B Drug Pricing Program was enacted with the intent of stretching scarce federal resources as far as possible to reach more eligible patients and provide more comprehensive services to the under-served population. For a Covered Entity, one of the key components for both staying compliant with the program and ensuring the generation of proper allocations is maintaining an accurate charge drug master (CDM) crosswalk. In addition to being aware of upcoming CDM crosswalk billing changes, additional analyses are performed to identify both CDM billing unit changes and billing discrepancies.

**Methods:** All medication charges are extracted monthly and two analyses are calculated for each CDM item: (1) an average monthly positive charge (AMPC), and (2) charge unit percentiles by CDM item. Each analysis is then separated into respective workbooks. AMPC data is entered onto a corresponding tab in a dashboard generating workbook (DGW) containing all historic AMPC extracts. The DGW displays all AMPC by month and calculates the absolute percent change by CDM item for the current month compared to the previous month. If AMPC data is not available for the previous month, the next available month containing AMPC data is used for calculation. All CDMs are then sorted by highest to lowest percent change for further review. In a separate workbook, the calculated charge unit percentiles are used as a reference for the extracted monthly positive CDM charges by individual line item. Individual charges that both exceed the high/low percentile threshold and are abnormally greater or lower than the median are further reviewed. All reviews identify current billing configurations as well as drug build configurations. Items identified for further review are done in a collaborative bi-weekly meeting with revenue management and information technology representatives.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: On a monthly basis, both the DGW and percentile analysis identify between 50 and 75 CDMs that either have high absolute AMPC percentage changes or abnormal individual line item charges. During the months the analyses have been performed, a variety of issues have been identified including (but not limited to): billing unit changes, configuration discrepancies between equivalent products, and charge discrepancies as a result of improper documentation. Issues identified were addressed appropriately with the collaborative efforts of our revenue management team, information technology representatives and 340B pharmacy team. Common corrective actions included updates to the CDM crosswalk, manual charge corrections, and drug billing configuration changes.

Conclusion: Oversight of a Covered Entity’s CDM crosswalk is key component for maintaining 340B Drug Pricing Program compliance. In addition to being aware of upcoming CDM crosswalk billing changes, the addition of analyzing both the AMPC data and charge unit percentiles by individual line item have demonstrated utility in identifying CDM billing unit changes and billing discrepancies.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-005

Poster Title: Validation of a pharmacy residency screening tool: leave no stone unturned

Primary Author: Daniel Hu, Providence St. Peter Hospital; Email: danhu808@gmail.com

Additional Author(s):
Danny Veenhouwer
Julie McCoy
Dominick Caselnova

Purpose: As the number of qualified applicants for PGY-1 residency positions continues to grow, programs are beginning to use screening tools to evaluate candidates. We conducted statistical analyses on a proprietary screening tool used to assess candidates applying to our PGY-1 residency programs at two sister hospitals with the purpose of assessing for opportunities to streamline the process and improve our methods.

Methods: Multiple reviewers scored applicants. The pool of reviewers included the residency program director, preceptors, and pharmacy PGY-1 residents. The scores were calculated based on six domains: community service, leadership experience, letters of intent, letters of recommendation, presentations/publication, and work experience. These scores were entered into PhORCAS, and then exported into Excel spreadsheets. De-identified data were sent to a biostatistician for statistical analyses. Three years of applicant score data were analyzed. The data were assessed to determine whether total scores and individual scores for candidates’ characteristics were associated with an invitation to interview. The data were also evaluated to assess for trends in applicant characteristics over time. T-tests were used to compare individual domains and total scores for applicants who were interviewed against applicants who were not interviewed. Chi-square tests were used to compare rates of interview across the two hospitals and by year. Logistic regressions were used to evaluate which domains affects the interview decision.

Results: Candidates who were invited to interview had significantly higher scores based on screening than candidates who were not interviewed (11.6 ± 1.3 vs. 8.1 ± 2.1, p < 0.001). The logistic regression showed that for every additional point scored during screening, candidates were 4.2 times more likely to be interviewed. When using the scores of individual domain in the multivariable logistic regression, all domains except for the domain of experience were
significantly associated to the likelihood of interview. This final model had a C-index of 0.93 (0.88, 0.99) and a Hosmer and Lemeshow goodness-of-fit test p = 0.39, indicating that the final model demonstrates an outstanding discrimination and a good level of calibration for correlation with likelihood of interview. Rates of interview were not significantly different across hospitals or by year. When assessed for trends by year of application, the total scores for all candidates regardless of interview status showed a trend of increase. However, no increase was seen for the domain of references and presentations and publications. When only the candidates invited to interview were evaluated, only the domains of community service and presentations/publications showed differences across application years.

**Conclusion:** Candidates who were invited to interview demonstrated higher scores in five out of six domains when assessed using our proprietary screening tool. The domain of work experience could be removed from the screening tool as it did not correlate with interview status. The likelihood of interview increased dramatically with every point gained on our screening tool, suggesting that the range of scores could be widened to permit further differentiation between candidates. The trends over time indicate that applicants are demonstrating higher qualifications regardless of interview status, likely an indication of the competitive nature of PGY-1 residency programs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Administrative Practice/ Financial Management / Human Resources

**Session-Board Number:** 4-006

**Poster Title:** Could regular review of formulary dose strengths reduce hospital drug expenditure? a quality improvement simulation

**Primary Author:** Rebecca Humbert, State University of New York Upstate Medical University; Email: humbertr@upstate.edu

**Additional Author (s):**
Robert Seabury
William Darko
Theresa Balotin
Bruce Stalder

**Purpose:** Increasing drug prices and decreasing hospital revenues necessitate that pharmacies look for unconventional cost reduction methods. One such way is to optimize the quantity of dispensed medication dosage units. For inventory management purposes, many hospitals maintain a single medication strength. To achieve the prescribed dose, some patients may require multiple dosage units. Tailoring formulary strengths to trends in utilized dose could reduce cost, if we assume similar cost per dosage unit. This project sought to characterize this opportunity using duloxetine as an example.

**Methods:** This quality improvement project was performed at a single academic medical center that keeps duloxetine 30 mg capsules as its formulary strength. We conducted a simulation to see if adding duloxetine 60 mg capsules as a second formulary strength would reduce drug spend. Duloxetine dispenses were identified via a query of pharmacy records between April 2017 and May 2017. Actual cost was calculated by multiplying the number of dispensed duloxetine doses by the acquisition cost of a duloxetine 30 mg capsule. Theoretical cost was calculated by dividing the dispensed dose by 60 mg and then multiplying this value by the acquisition cost of a duloxetine 60 mg capsule. If the ordered dose was 90 mg, the theoretical cost was estimated as the sum of the acquisition costs for a 30 mg and a 60 mg duloxetine capsule. If the ordered dose was duloxetine 30 mg, the theoretical cost and the actual cost was the same. The primary outcome was the estimated difference in monthly and yearly drug cost.

**Results:** Duloxetine was dispensed 217 times from April 2017 to May 2017 and the dispensed doses were as follows: duloxetine 30 mg, 72/217 (33.2 percent), duloxetine 60 mg, 108/217

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
(49.8 percent), duloxetine 90 mg, 20/217 (9.2 percent), and duloxetine 120 mg, 17/217 (7.8 percent). Actual total cost during the study period was $407.68. Theoretical cost utilizing 60 mg capsules when applicable was $227.86. Adding duloxetine 60 mg capsules as a formulary strength would reduce drug cost by $179.82 per month and $2157.84 per year. This would be a forty-four percent savings.

**Conclusion:** It appears adding duloxetine 60 mg capsules as a formulary strength could reduce annual drug spend by more than $2,000. Though this cost reduction appears relatively small, it only represents a single agent. Regular and systematic application of this evaluation process may translate to significant pharmaceutical cost savings for health systems.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-007

Poster Title: Structure and economic impact of pharmacy driven patient assistance program in a community teaching hospital

Primary Author: GaEun Joung, Englewood Hospital and Medical Center; Email: gjoun2@gmail.com

Additional Author(s):
Christina DeMarco
Joseph Cruz
Jeffrey Nemeth

Purpose: The latest report of the National Health Interview Survey conducted by the Census Bureau estimated that 28.6 million (9.0%) persons of all ages were uninsured in 2016. However, even amongst the insured, significant amount of people remain underinsured to be able to afford their out-of-pocket costs or deductibles. The purpose of this descriptive report is to describe the current structure of obtaining medications through patient assistance programs for indigent patients and to assess the economic impact of having a pharmacy driven patient assistance program at a community teaching hospital.

Methods: Outpatient medications for indigent patients were proactively obtained through patient assistance programs by pharmacists. Patients were identified by pre-certs and health care providers in the physician’s offices and the outpatient infusion center, who then notified the pharmacist to complete the patient assistance application for high-cost drugs prior to scheduling treatment. Pharmacists also previewed the outpatient schedule on a weekly basis in order to identify potentially missed charity care or self-pay patients. Rather than having a dedicated pharmacist, the responsibilities were spread out among three pharmacists. Patient approval and/or drug shipment receipt was relayed to the oncology pharmacists and the charge master coordinator in order to prevent duplicate billing. Similar process took place for inpatient requests. The pharmacist completed and submitted the patient assistance program application upon request by a physician. Once a patient was approved through the patient assistance program, the medical team coordinated patient discharge and medication reconciliation pending expected arrival of drug supply. Pharmacists also ran a retrospective quarterly report of pre-identified high-cost drugs that were administered to a charity care or self-pay patient. If the drug was recovered, replacement was communicated to the charge

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
master coordinator for charges to be removed retroactively. Receipt of drugs obtained through patient assistance programs were documented and invoices kept in a separate binder. Savings were quantified based on the hospital’s acquisition cost on a regular basis.

**Results:** Over the course of eight months, 94 applications were completed for 57 patients. Of the 57 patients, 39 (68%) patients had at least one or more applications that were approved where 27/39 (69%) patients were either charity or self-pay (uninsured) and 12/39 (31%) patients had either commercial or governmental insurance (underinsured). Of the 94 applications, 61 (65%) applications were approved, 12 (13%) were denied, and 21 (22%) were identified and started but never completed. The total cost of drugs received during the eight months from patient assistance programs was $1,005,025. Of the total cost, $910,823 (91%) recovered were for medications that were administered in the outpatient infusion center. The high-cost drugs for the outpatient infusion center included: infliximab, pertuzumab, pembrolizumab, rituximab, and trastuzumab. The remaining $94,202 (9%) were medications for inpatient use, at discharge, or oral medications requested from the physician’s offices. These medications were: adalimumab, albendazole, apixaban, alteplase, dalbavancin, ertapenem, insulins, and tenofovir alafenamide.

**Conclusion:** There has and will continue to be an increasing trend of medications that will lead to a high bill for the patients due to the rising cost of newer agents on the market, such as the anti-PD1 monoclonal antibodies in oncology. Also, as the number of uninsured and underinsured patients increases, institutions will greatly benefit from having either a dedicated financial coordinator or a team in place for patient assistance programs. At our institution, the establishment of a pharmacy driven patient assistance program helped recover over $1 million in drugs during an eight month time frame.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-008

Poster Title: Reduction in percent of formulary medication stock outs in Pyxis ES

Primary Author: Marybeth Kazanas, MedStar Health; Email: marybeth.kazanas@medstar.net

Additional Author(s):
Denise Kingsbury

Purpose: With the rapid expansion of Automated Dispensing Cabinet applications, identified areas of concern include cost, waste, medication access and security, and employee satisfaction. From February 2015 through May 2015, the MedStar Montgomery Medical Center Department of Pharmacy Services experienced medication stock outs in Pyxis CUBIES at a mean rate of 1.22%. Unexpected stock outs impact patient care by causing delays in therapy. The goal of this project was to decrease the mean percent of Pyxis CUBIE stock outs for formulary medications from 1.22% to the national standard of 0.60%.

Methods: Lean Six Sigma methodology was used to review the stock out process and ultimately identify solutions for improvement. In define a high level process map and voice of the customer survey was completed. Next the voice-of-the-customer (VOC) was used to identify what is critical-to-quality (CTQ) of the Process. In measure a detailed process map and detailed data analysis was completed to assure a complete understanding of the process. Data was then analyzed to determine the root causes. Once the root causes were identified, improvement strategies were then tested based on the proven root causes attributing to pyxis stock outs. A pilot was then completed which focused on defining minimum and maximum stock levels for medications stored in the central pharmacy and Pyxis CUBIES.

Results: For the control period from Oct 5 - Nov 1, 2016, the rate of Pyxis CUBIE - (R) stock outs was 0.57% and the process is in control. The rate in the pilot period decreased from 1.22% as observed in the baseline period (Feb 1 - May 31, 2105), 0.93% in the pre-pilot period (June 2015 - Aug 2016) and 0.66% in the pilot period (Sept 7-Oct 5, 2016) and has reached the goal rate. By reducing the rate of Pyxis CUBIE stock outs (0.57%), an annual savings of $11,666 was achieved.

Conclusion: Reducing the percent of formulary medication stock outs in an automated dispensing cabinet decreases cost associated with additional courier services to procure
medications as well as waste pertaining to time and motion of those affected by a stock out. Reducing stock outs also increases employee satisfaction for the front line staff that must perform workarounds to countermeasure a stock out. In addition, the quality of pharmaceutical management of patients increases when medication stock outs decrease.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-010

Poster Title: The revision of inpatient antineoplastic infusion admission guidelines for cost containment

Primary Author: Heidi Larson, Hennepin County Medical Center; Email: heidi.larson@hcmd.org

Additional Author(s):
Adrienne Donaldson

Purpose: Hennepin County Medical Center (HCMC) is a 400-bed disproportionate share hospital participating in the 340B Federal Drug Discount Program with over 45% of patients uninsured or under-insured. To continue to be a viable treatment and care center, it is vital to seek cost containment opportunities. Antineoplastic agents represented the drug class with the highest inpatient drug spend and was the largest driver of inpatient spend growth. In addition, many antineoplastic agents are high cost drugs. Due to these trends, the pharmacy department developed a cost savings initiative to reduce inpatient drug spend by moving antineoplastic infusions to the outpatient setting.

Methods: Implementation of this initiative included the formation of an interdisciplinary team of pharmacy staff, infusion clinic staff, physicians, and finance personnel. Once the new team was formed, the pharmacy staff’s first step focused on educating the rest of the team members on the 340B Federal Drug discount program and regulations for reimbursement. The second step of the education for the team addressed medication spend on these agents including a list of the targeted high dollar antineoplastic infusion agents along with their respective cost. Upon completion of the education components, an analysis by the oncology staff was performed to determine what, if any, opportunities for practice change existed. Modifications to their antineoplastic infusion admission guidelines included a change to admitting patients that oncology felt would not be compliant due to educational challenges and concerns about a return to the clinic for therapy. The revised antineoplastic infusion admitting guidelines determined opportunities would be evaluated on a case by case basis utilizing new criteria which included: Patient evaluation including patient understanding of diagnosis and treatment plan, Tumor Load and underlying risks, and Observation status. Financial monitoring was performed post-implementation through EMR reports (number of inpatient antineoplastic

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
patients, number of inpatient IV infusions, and inpatient charges) and wholesaler reporting systems (inpatient antineoplastic drug spend).

**Results:** Oncologists at HCMC began evaluating antineoplastic infusion patients using the revised antineoplastic infusion admitting guidelines in April of 2016. In the first 12 months (April 2016 - March 2017) after implementation, there was a 26% decrease in the number of antineoplastic infusion patients admitted to the hospital for infusion therapy. The number of inpatient antineoplastic infusions decreased 29.5% from 912 infusions to 643 infusions. Inpatient charges also decreased 68.4% from $1,944,876 to $614,700. These dramatic decreases in inpatient results are mainly attributed to the education and new awareness the providers received on the antineoplastic drug spend and which drugs tended to be more expensive. In addition to the inpatient results, an 80.13% ($254,564) reduction in the GPO inpatient drug spend for antineoplastic agents was realized. It was noted that the combined GPO, 340B, and WAC antineoplastic drug spend also showed a decrease of 3.36% (-$140,982).

**Conclusion:** Revising the antineoplastic infusion admission guidelines reduced inpatient antineoplastic infusion admissions by 26%, reduced inpatient antineoplastic infusions by 29.5% and reduced charges for inpatient antineoplastic infusions by 68.4%. Additionally, inpatient (GPO) antineoplastic agent drug spend was reduced by 80.13% ($254,574) while the combined GPO, 340B, and WAC antineoplastic drug spend also realized a spend reduction of 3.36%. Oncologist evaluation for admitting patients to the inpatient settings for infusion is continuing at HCMC. Hospitals with in-house infusion centers should consider a collaboration with pharmacy and oncology providers to assess if there is an opportunity to decrease inpatient infusion practices.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-011

Poster Title: Controlled substance diversion in health systems: failure mode and effects analysis for prevention

Primary Author: Karen Nolan, Rhode Island Hospital; Email: knolan@lifespan.org

Additional Author (s):
Andrew Zullo
Elliott Bosco
Christine Marchese
Christine Berard-Collins

Purpose: Conducting a Failure Mode and Effects Analysis (FMEA) may help health systems identify the highest priority sources of controlled substance diversion and develop preventative strategies. The objective of our study was to systematically identify potential sources of controlled substance diversion and develop solutions in an academic health system. This study provides an example of how a FMEA might be applied by other health systems to prioritize and implement diversion risk reduction strategies.

Methods: The FMEA was conducted by an 18-member cross functional team from the Department of Pharmacy at an academic health system. Though a FMEA has many adaptations, the team developed scoring criteria specifically for controlled substance diversion. After outlining the controlled substance supply process, the team identified various ways in which each step and substep of the medication supply process might fail, also known as failure modes, and result in diversion of controlled substances. The team assigned each failure mode a rating for severity and another for probability of occurrence. These ratings were then multiplied together to determine the hazard score, with a higher score reflecting a greater opportunity for diversion. Failure modes with a hazard score greater than or equal to 12 were also assigned a control value to determine the likelihood that a potential failure would be detected. From this, a vulnerability score was calculated by multiplying the hazard score and control value. Failure modes with a vulnerability score of 48 or 64 were considered highest risk and were immediately intervened on by the FMEA team.

Results: The FMEA outlined a total of 10 major steps and 30 substeps in the controlled substance supply process. From this, 103 potential failure modes were identified, with 24...
modes (23 percent) receiving a vulnerability score of 48 or 64. Development of specific reports addressed 15 failure modes, while 9 involved pharmacy workflow alterations. In some cases, one implemented measure simultaneously addressed multiple failure modes. Workflow actions included: optimizing automated dispensing cabinet settings; installation of additional cameras in pharmacy vault, non-sterile preparation area, and clean room; product imprint verification; reconciliation of expired medications with reverse distributor; installation of a limited-access safe for expired medications; and additional verification requirements. Specific reports that emanated from the FMEA included: reconciliation report covering previous 2 shifts; extended reconciliation report for management; discrepancies by medication, user, and patient care areas; overall usage by drug, quantity, and user; drug movement to capture expected purchases by drug; temporary patient controlled substance usage; and waste transactions by user and witness. Pharmacy operations and management review reports on a daily, weekly or monthly basis depending on the report type. Most reports were designed to generate automatically. Temporary patient controlled substance usage and discrepancy reports presented as notable failure mode solutions.

**Conclusion:** FMEA is an important tool that can be used to help address controlled substance diversion in health systems. The steps involved in a FMEA allow for systematic identification of diversion opportunities and the development of targeted strategies to reduce risk of diversion. Some of the high vulnerability failure modes we identified that are most applicable to other health systems included inappropriate removal of more controlled substances than needed and witnesses not observing waste. The FMEA proved to have the greatest utility in the creation of specific reports, allowing for existing data to be leveraged and provide comprehensive monitoring for diversion.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-012

Poster Title: Admission medication histories performed by student pharmacists at a large academic hospital

Primary Author: Drew Raley, UAB Hospital; Email: draley@uabmc.edu

Additional Author(s):
Christopher Chapleau
Mary Hatcher

Purpose: The purpose of this project is to analyze the quality and overall capture rates of medication histories performed by student pharmacists at UAB Hospital. There is an abundance of recent literature describing the benefit of incorporating clinical activities into the fourth-year pharmacy curriculum. This can be combined with evidence supporting an admission medication history process that reduces medication errors. Combining these two elements has the potential to facilitate development of student pharmacists while optimizing patient care and providing a purposeful service for the institution.

Methods: A concurrent review of admission medication history reports being performed by student pharmacists on various units at UAB Hospital in Birmingham, AL between September 2016 and March 2017. All patients admitted to the study unit were eligible for inclusion. Inclusion was at the discretion of the preceptor for each student. Patients were excluded if they were unable to accurately verbalize their medication history or if confirmation of their history could not be obtained from a pharmacy, physician’s office or caregiver. Student pharmacists completed an extensive training program prior to performing a medication history. The program was led by the medication history pharmacist and consisted of both didactic material and active learning. Students then performed medication histories at the bedside, entered appropriate information into the EMR and documented identifying information for the purposes of this review. Investigators audited each medication history for the following criteria: number of medications, medications missing, inaccurate medications, incomplete medications, duplicate medications, completed regimens, updated compliance and total time spent obtaining the information.

Results: A total of 304 medication histories were reviewed containing 2174 individual medications. The average home medication list contained 7 medications and took a mean time
of 9.2 minutes for student pharmacists to complete. During the study period, a total of 92 errors were identified, meaning that on average 1 error was found in every 24 medications that was reviewed. The primary result of the study was medication history “accuracy rate” which was defined as the percentage of medication histories that contained zero errors and could be used by the prescriber for reconciliation. Student pharmacists achieved an accuracy rate of 80% which can be compared to previous studies that found pharmacists achieved a rate of 90.18% while nurses achieved just 27.74%. The most common type of error found was incomplete medications (n=53), followed by duplicate medications (n=23), inaccurate medications (n=11) and missing medications (n=5). Finally, we assessed the capture rate of student pharmacists which was defined as the percentage of patients admitted to the unit that were interviewed on weekdays when a student was on rotation. Student pharmacists had a capture rate of 43%, taking a large workload away from other clinical disciplines.

Conclusion: Student pharmacists are able to accurately and effectively perform medication histories at a large academic hospital. This is evidenced by an accuracy rate of 80%, second only to clinical pharmacists. Also, student pharmacists have shown the ability to efficiently perform a large number of medication histories as seen in the capture rate of 43% and an average time of 9.2 minutes per report. This takes a large workload away from multiple members of the clinical staff and allows them to devote time to other tasks. This process also benefits the pharmacy student by providing direct patient contact and care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-013

Poster Title: Expense reduction achieved after switching from lidocaine 5% ointment to lidocaine 2% jelly switch in post-partum order sets

Primary Author: Urshila Shah, New York Presbyterian Hospital; Email: urs9004@nyp.org

Purpose: In 2015, New York Presbyterian Hospital (NYPH) spent over $1.4 million (based on average wholesale price or AWP) on lidocaine 5% ointment. About 90% of its use was in the obstetrics patients due to its inclusion in two postpartum order sets. Each patient received a 35g tube of lidocaine 5% ointment which was discarded upon patient’s discharge, which resulted in significant waste since much of the product remained in the tube upon discharge. This project was designed to measure the expense reduction switching from lidocaine 5% ointment to lidocaine 2% jelly, which is available at a substantially lower cost.

Methods: In February 2016, a proposal was presented by the Pharmacy to the NYPH Perinatal Practice Committee (PPC) to replace lidocaine 5% ointment, which is administered every 8 hours with lidocaine 2% single dose jelly every 6 hours in both the post-partum caesarian section and vaginal delivery order sets. After approval from the PPC, this change was communicated to the order set committee to modify existing orders. Once tested and approved, the Pharmacy mobilized forces to implement this change. Various groups within the Pharmacy were involved in implementation include staff from operations, automation, and procurement groups. The pharmacy was able to mobilize this operation within a month of approval from the order set committee. Finally, all parties involved in the project were informed of the changes and go live dates.

Results: The quantity and therefore cost of lidocaine 5% ointment has decreased drastically as a result of this cost savings initiative. The quantity of the product purchased declined by 80%; from an average of 419 tubes to 82 tubes per month. Based on the AWP price of $300 per dose of lidocaine 5% ointment and accounting for the increased usage of lidocaine 2% jelly the net savings for pharmacy department were about $1.18 million dollars within a year of project implementation.

Conclusion: Switching from lidocaine 5% ointment to lidocaine 2% jelly for use in obstetrics patients was a financially noteworthy project for the NYPH Pharmacy and organization. Review
of other standardized order sets for high-cost medications with less expensive alternatives presents an opportunity for identifying cost reductions in hospitals.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-014

Poster Title: Patients’ knowledge of the role of clinical pharmacists and perception of the need for their services in Lebanon

Primary Author: Marwan Sheikh-Taha, Lebanese American University; Email: marwantaha@yahoo.com

Additional Author(s):
Louna Koaik
Richard El Housseiny

Purpose: Clinical pharmacists, as part of the health care team, participate in the health plan of the patient to ensure better coordination of care directed toward the best health outcome possible. Unfortunately, the majority of the Lebanese hospitals lack a clinical pharmacist. The objective of this study was to assess the knowledge of the inpatients about the roles of the clinical pharmacist and the perception of the need for their services.

Methods: A cross sectional survey was conducted in a Lebanese hospital in Beirut in spring 2017. The study population consisted of patients admitted to the internal medicine and cardiology services and parents of children admitted to the pediatrics service. Patients in the emergency department or in the intensive care unit were excluded from the study.

Results: A total of 141 participants were included in the study whose age ranged between 18 to 85 years, and 77 (55%) were females. Of the patients/parents interviewed, 104 (73.8%) did not have an idea about the role of clinical pharmacists, yet 119 (84.4%) believed there was a need for clinical pharmacists in a hospital setting. After explaining the role of clinical pharmacists, the percentage increased from 84.4% to 94.3%. Participants with age above 65 years and those with no high school degree were more likely to believe that there was no need for clinical pharmacists (p < 0.05). It is noteworthy that 112 (79.4 %) of the participants were not counseled about their disease states or medications as the hospital lacked clinical pharmacy services.

Conclusion: In our study, the majority of participants were not aware of the role of clinical pharmacists, yet they believed that there was a need for their services in a hospital setting.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Administrative Practice/ Financial Management / Human Resources

**Session-Board Number:** 4-015

**Poster Title:** Implementation of emergency department (ED) pharmacy team in a community hospital: pilot to approval of permanent service

**Primary Author:** HyeJin Son, Baptist Health Medical Center - Little Rock; **Email:** hyejin.son@baptist-health.org

**Additional Author(s):**
David Fortner
David Cobb

**Purpose:** The number of pharmacists practicing in the Emergency Department (ED) has been increasing in the United States. According to the 2012 American Society of Health-System Pharmacists national survey of pharmacy practice in hospital settings, 47.8 percent of hospitals with 400-599 beds have dedicated pharmacists assigned to the ED. Implementation of an ED pharmacy team, consisting of a clinical pharmacist and a pharmacy technician, was proposed to hospital administration to ensure medication use in the ED is evidence-based, cost-effective and adheres to guidelines and quality measures. A one-year pilot of the ED pharmacy team was approved with five measures of success.

**Methods:** The ED pharmacy team was launched September 1, 2016. Four full time equivalents (FTEs) were approved for the pilot; 2 pharmacists and 2 pharmacy technicians. The hours of service included 11 AM to 11 PM daily for the pharmacist and 11 AM to 9:30 PM daily for the pharmacy technician. The main responsibility for the pharmacist included prospective review of medication orders, on-the-spot drug information source, emergency/code response, patient counseling, culture and sensitivity follow up on discharged patients, and implementation of cost-savings initiatives. The pharmacy technician was responsible for obtaining accurate patient medication histories and allergies as well as assisting the pharmacists with assigned duties. The five measures of success included reduced drug cost, improved patient safety and quality, improved outcomes for the Center for Medicare and Medicaid Services (CMS) SEP-1 bundle, reduced opioid usage in ED, and an improved patient experience. ED pharmacists and technicians documented their activity related to the five measures of success using tools in the electronic medical record.
**Results:** The 6-month status report for the five measures of success was presented to the senior administrators. Reduced drug cost of $183,653 were documented through direct patient care interventions and cost savings initiatives. Improved patient safety and quality through medication history review resulted in an estimated cost avoidance of $3,115,612. CMS SEP-1 bundle pass rates increased from 29.1 percent in November 2016 to 51.3 percent in February 2017. Total opioid usage in the ED decreased 22 percent when compared in IV morphine equivalents. Patient satisfaction measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey showed an 8 percentile increase in the medication communication score for patients that were admitted to the hospital through the ED. In addition, physicians, nurses and patients from both the ED and inpatient units expressed the value and appreciation of the ED pharmacy team to the senior administrators. The ED pharmacy team pilot was deemed a success after 6 months, and the service was approved for permanent implementation. Furthermore, 6 additional FTEs were granted to expand medication history review service to all patients by pharmacy technicians. Additionally, there were preliminary discussions about expansion of the ED program to other facilities in the health-system.

**Conclusion:** A unit-based pharmacy team consisting of a clinical pharmacist and a pharmacy technician in the ED have proven the ability to successfully decrease drug cost and opioid usage in ED as well as increase patient safety and quality, CMS SEP-1 pass rates, and patient satisfaction.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-016

Poster Title: Inpatient dose de-escalation reduces hospital pharmacy costs

Primary Author: Katherine Thompson, Bryan Health; Email: kah85184@creighton.edu

Additional Author(s):
Jerome Wohleb
Scott Persson

Purpose: Drug costs continue to increase at a double-digit rate according to the American Journal of Health-System Pharmacy (Schumock, DOI 10.2146/ajhp160205). Identifying strategies to keep the hospital financially stable is required. Bryan implemented several programs to impact drug expenses. Many patients are initiated on unnecessary medications, especially upon admission. Optimizing a patient’s medication profile and avoiding excessive medications reduces the dose/day ratio and leads to lower pharmacy costs for the hospital. This study will highlight dose de-escalation successes.

Methods: The medication reconciliation program was the driver behind the decreasing the average number of inpatient medication doses/inpatient days. The medication reconciliation process begins with patient admission. The nurse makes a quick prior to admission medication list using resources available including patient interview, medication bottles if available, insurance information, and previous discharge lists. Once the nurse has that information entered, a pharmacy technician continues to follow up with outpatient pharmacies to check refill histories in order to verify compliance and compile a complete list. This more robust list is then, again, gone through with the patient or the patient’s family. At this point, the pharmacist steps in to verify the technician’s work, provides the physician with the most accurate list as possible, and makes recommendations, if applicable, to the physician of which medications to continue or hold based on the acuity of the patient’s hospital stay. The data collection of the doses/day was based on bedside barcode and manual charges at the bedside. Which is more accurate than depending on a machine’s dispensed count and averaging that number between the patients. The ratio of inpatient doses/inpatient days is a reliable account of doses the patient received while inpatient. The report of medication doses/day was reviewed and tracked monthly and the average ratio for the year was calculated from the monthly numbers.
Results: A total of an 11% reduction was seen with FY16 average inpatient doses/inpatient days being 24 from FY15 ratio of 27. The benefits seen from this reduction include a decrease in overall drug use, potential errors and adverse events, pharmacist and technician time spent working on drug orders and moving the drug to various locations, and pharmacy costs. Ultimately, the patient receives the greatest benefit. With the most accurate home medication list, patients avoided unnecessary use of medications or the potential for an incorrect medication to be administered. According to nurses on the cardiac unit, it takes three minutes from order to administration to give a patient one dose of a medication. Doses dispensed has decreased by 11%, which is saving nursing medication administration time for more quality patient care activities. Opportunities for expansion exist, of the 11962 patients admitted during 2016, 35% of those patients were a part of the admission medication reconciliation process. A potential for development to the other 65% of admitted patients exists, which gives potential for further dose de-escalation. Continuation and improvement in processes can only lead to more significant quality improvements for patients and caregivers, in addition to larger projected savings for FY17.

Conclusion: Improving patient outcomes and reducing costs is a priority in the inpatient hospital pharmacy setting. Reducing the ratio of inpatient medication doses to inpatient days through admission medication reconciliation is an effective way to accomplish these two outcomes. Moving forward, the focus may shift from admission reconciliation to decreasing patient home doses at discharge and optimizing the patient’s home medication list. This will require expansion of the medication reconciliation program and coordination and collaboration with outpatient physicians to bridge the transition from inpatient to outpatient status. Ultimately, increase patient adherence, reduce drug expenses, and decrease potential for unnecessary medication use.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Administrative Practice/ Financial Management / Human Resources

**Session-Board Number:** 4-017

**Poster Title:** Pharmacy financial reporting package: budget variance evaluation and identification of expense mitigation initiatives

**Primary Author:** Robyn Vonderheyde, Yale New Haven Health System; **Email:** robyn.pisacane@ynhh.org

**Additional Author (s):**
Marjorie Lazarre
Adrienne Donaldson

**Purpose:** Yale New Haven Health System (YNHHS) consists of 2,563 licensed beds and specializes in more than 100 medical specialties and subspecialties across four Delivery Networks (DNs). Pharmaceutical expenditures at YNHHS account for a significant portion of the organization’s operating budget. Consequently, pharmaceutical expenditures resulting in budget variances at each of the DN’s require a standardized approach to analysis with collaboration among Pharmacy leadership and Corporate Finance. Furthermore, expense deviations identified from these analyses serve as a robust source for new cost containment initiatives, both clinical and operational.

**Methods:** The implementation of a standardized pharmacy financial reporting package began by identifying the top five contributing factors influencing pharmaceutical expenses; purchase volume, pricing inflation, new technology, standing inventory value, and business plan performance.

The development of the pharmacy financial reporting package is structured by data generated from the pharmaceutical wholesaler’s reporting system for each of the analyses with the exception of inventory. Inventory reporting is collected through automated dispensing machine (ADM) and central pharmacy inventory control software which provides a real-time account of standing inventory.

The annual pharmaceutical budget for each DN at YNHHS is based on the actual pharmaceutical expenditures of the previous fiscal year, with adjustments for planned service line expansions, projected pricing inflation, and new business plans with demonstrated impact on pharmaceutical expenditures. As such, this reporting package compares current expense versus the previous fiscal expenditures comprising the budgeted base.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Review of the purchase volume and pricing variations is National Drug Code (NDC) specific. New technology analyses account for new NDCs purchased, with an adjustment for NDCs that are no longer procured. A customized reporting dashboard is developed to monitor performance of business plan targets.

Monitoring of pharmaceutical expense versus budget using this package is conducted monthly. The deviations in expense identified are presented to Pharmacy leadership and Corporate Finance; initiatives to control and/or reduce expenditures based on these findings are pursued.

**Results:** Fiscal year 2017 year to date (FY17 YTD), this package has proven effective at explaining 92.2% of the total dollar pharmaceutical budget variance at YNHHS.

The largest contributors to budget overages in the current fiscal year were determined to be the result of purchase volume increases and new technology, in the setting of a stable standing inventory value. Notably, pricing inflation FY17 YTD has not been identified as a top contributor to the pharmaceutical budget variance at YNHHS due in part to an infusion of additional budgeted dollars based on projected pricing inflation.

To mitigate the increased expenditures related to both purchase volume increases and new technology, targeted initiatives across both clinical and operational pharmacy domains have been developed using the details garnered by this financial package. These initiatives include, but are not limited to, pharmaceutical contracting targets, product line conversions, additions to formulary restriction, practitioner guided dosage optimization through computerized order entry pathways, charge capture and 340B performance enhancements, beyond use dating optimization, and inventory and waste reduction strategies.

This package is founded largely on a budget base developed from previous fiscal year actuals. The package should be tailored to an institution’s specific budgetary model.

**Conclusion:** The standardized pharmacy financial reporting package has provided continuity and enhanced detail in describing pharmaceutical budget variances at YNHHS. This package has aided in the explanation of 92.2% of the pharmaceutical budget variances FY17 YTD. Insight into the primary contributors to pharmaceutical budget variances provides direction to pursue valuable clinical and operational initiatives. Hospitals and Health Systems Pharmacy leadership should consider the addition of a standardized financial reporting package, in partnership with Corporate Finance.
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-018

Poster Title: Creating sustainable solutions (Flex Teams) to achieve minimum staffing requirements across pharmacy services in a multi-hospital health system

Primary Author: Richard Wojtowicz, Baystate Medical Center; Email: richard.wojtowicz@baystatehealth.org

Additional Author (s):
Erin Taylor
Sean Illig
Aaron Michelucci

Purpose: Meeting and sustaining minimum staffing requirements across our multi-hospital health system prompted us to identify more flexible staffing solutions. The team’s goal was to create a pool of flexible resources (flex team) with system wide competency to cover medical leave, sick calls, vacations and open positions across all sites to sustain minimum staffing requirements while remaining budget neutral across all cost centers and reducing employee burnout from overtime.

Methods: Exploratory conversations began with our nursing colleagues who have a similar flexible staffing model at our flagship campus to understand budgeting, scheduling and overall program sustainability. To assess our flex team opportunity a report was created in our budgeting software to compare weekly productive pharmacist and technician hours to minimum staffing models at each site. Using this information and historical nonproductive time use, we were able to estimate a vacancy factor, which represented the total number of flex positions needed. Additional considerations for the operationalization of this concept included the development of a separate cost center to ensure appropriate accounting of productive staffing hours to each site, as well as orientation and training of each flex team staff member at each site to ensure competency in site specific workflow, technology and operations.

Results: The flex team started with three full time pharmacists and recently expanded to include two full time technicians to cover the identified vacancy factor across all Baystate Health entity pharmacies. With the creation of the flex team, we have been able to sustain our minimum staffing requirements while remaining budget neutral across all sites and reducing the need for additional shift coverage from our core staff. In addition we have shown a

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
decreased vacancy factor, reduction in overtime use, and have not had to cancel a shift for a flex team employee, validating the addition of resources was appropriate. In Fiscal year 2017 the variance between our minimum staffing requirement and productive hours worked reduced from 7.7 full time equivalents to 3.0 full time equivalents.

**Conclusion:** Utilizing the concepts of system integration helped our team identify the flex team concept and has afforded us the opportunity to create a sustainable solution to our ongoing staffing challenges. This team has also given us the time to standardize practices across our system and has provided time for training that we had struggled to find in the past. We are now working through who at the system level is best suited to control our flex team schedule to maximize the value this team can bring.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Administrative Practice/ Financial Management / Human Resources

Session-Board Number: 4-019

Poster Title: Impact of pharmacist coaching on compliance with a metronidazole dosing collaborative drug therapy management agreement in a health system

Primary Author: Susan Wollum, St. Luke's Hospital of Kansas City; Email: jswollum@gmail.com

Additional Author(s):
Timothy Woods

Purpose: Effective collaborative drug therapy management (CDTM) requires adherence to the agreement by the pharmacist for good patient outcomes, positive financial impact, and to minimize liability. The purpose of this project was to assess pharmacist compliance with a metronidazole dosing CDTM agreement and assess the impact of pharmacist coaching on subsequent compliance.

Methods: Data from the electronic medical record (EMR) was collected for all patients receiving metronidazole in the fourth quarter of 2015. Data collected included patient location, dose, route, frequency, indication, pharmacist verifying the order, and ordering provider. Orders were excluded from analysis if they were any route other than intravenous, if they were single doses, or perioperative. The data was analyzed to determine baseline compliance with the CDTM agreement by pharmacist, location, and overall as a health system. The pharmacist verifying the order for metronidazole was determined to be in compliance with the CDTM agreement if once daily dosing was employed in patients who were not excluded. Those pharmacists who had more than two instances of non-compliance with the CDTM received coaching regarding the agreement after the initial audit. The same metronidazole data was collected from the EMR in the first quarter 2017 and analyzed with the same methods. To assess performance improvement, first quarter 2017 compliance was compared to fourth quarter 2015 compliance by pharmacist, location, and overall as a health system.

Results: There are five locations in the health system, numbered here 1 through 5. Location 1 had a compliance change from 71 percent to 89.5 percent, for an improvement of 18.5 percent. Location 2 had a compliance change from 86.8 percent to 91 percent, for an improvement of 4.2 percent. Location 3 had a compliance change from 94.5 percent to 99 percent, for an improvement of 4.5 percent. Location 4 had a compliance change from 84.3 percent to 96.8 percent, for an improvement of 12.5 percent. Location 5 had a compliance change from 73.8

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
percent to 92.1 percent, for an improvement of 18.3 percent. The health system had an overall compliance change from 84.7 percent to 10.2 percent. In the fourth quarter of 2015 there were 4 pharmacists who received coaching, their baseline combined compliance average was 66.1 percent. After coaching, their compliance average was 93.8 percent, for an improvement of 27.7 percent.

**Conclusion:** Coaching had a positive impact on individual pharmacist compliance and overall compliance with a metronidazole dosing CDTM agreement in a health system.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-020

Poster Title: Provision of consistent, quality ICU services through creation of a critical care pharmacy team in a community hospital with limited clinical resources

Primary Author: Liza Andrews, Rutgers/RWJBarnabas Health, Hamilton; Email: lbarbarello@pharmacy.rutgers.edu

Additional Author(s):
Penelope Wasylyk
Katherine Mundhenk
Shesha Desai
Alex Kados

Purpose: Consensus regarding ideal elements of critical care pharmacy services (CCPS) have been available for nearly two decades, yet achieving consistent high quality services remains challenging in community hospitals with limited clinical resources. In a 20 bed ICU in a suburban community hospital, CCPS were provided at two levels for 15 years - 24-hour general practice pharmacist support supplemented by limited presence of a critical care specialist. In 2015, the critical care specialist position transitioned to a board certified, faculty-based clinical specialist who sought to establish a team approach to standardize both type and quality of service, thereby achieving higher practice standards.

Methods: To ensure consistent, high level critical care pharmacy services provision 7 days a week, the clinical specialist recruited three pharmacists from staff who expressed interest in additional training to develop specialized knowledge of and comfort with bedside critical care practice. The pharmacists had between 24 and 34 years practice experience, entered practice with BS Pharmacy degrees, with two earning subsequent PharmDs prior to program initiation. The group was preferentially scheduled in the ICU satellite, each providing clinical services every third weekend to support 7 day clinical support and rounding; “curbside” on call consultation of the clinical pharmacist was highly encouraged. The training program implemented included a fusion of classroom learning, curbside consultation and bedside clinical work. Pharmacists initially shadowed the specialist during patient care activities, increasingly taking a leading role over time with continued support of the specialist. Tools, processes and practice standards were developed to support uniform clinical assessments, information sharing and continuity of care. Reference materials, binders and articles were made readily

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
available for both evidence based topics and institutional protocols. Lunchtime education topics were offered throughout the year to support universal continuing development of critical care knowledge of the entire staff beyond the core team. Initial clinical focus was placed on care reflected in “FAST HUG-MAIDENS” acronym, such as pain and agitation management in ventilated patients, antimicrobial optimization, and supportive care.

**Results:** The seamless team that evolved over the first year of the program reliably provided a consistent level of pharmacy practice as well as continuity of care for individual patients. Initial weekend on call support was consistently required but significantly decreased within six months. The pharmacists were highly motivated by the enhanced clinical role, all self-engaging in active learning. One pharmacist both obtained her board certification and enrolled in a PharmD program while the others, who had obtained their PharmDs previously, initiated plans to seek board certification. The clinical pharmacist sought customer (i.e., intensivist and nursing) feedback at regular intervals, which consistently reflected great satisfaction with the quality and continuity of pharmacy care; the intensivists self-reported positive feedback to both pharmacy and upper administration. Physicians who once selectively sought out the clinical specialist regarding clinical issues developed confidence in the team, accepting and implementing feedback from all members equally. The team approach supported both successful implementation and adherence to clinical pharmacy protocols and practice standards, which had previously been inconsistently applied. Reflective of their satisfaction and view of the team as core to practice, the intensivists requested development of pharmacy protocols to support increased practice autonomy, which are now in development.

**Conclusion:** In a community hospital with a single clinical full-time-equivalent (FTE), a critical care pharmacist team evolved under the leadership of the critical care specialist allowing for successful provision of consistently high quality pharmacy services. This extended clinical service availability to 7 days/week, significantly increasing the availability previously provided approximately 3 days/week with the specialist alone. Uniform satisfaction with the enhanced clinical role was reflected in the self-initiated professional development and active learning of each team member. The model was well accepted by the multidisciplinary team, resulting in requests for mechanisms/protocols increasing pharmacist autonomy, which are currently in development.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-021

Poster Title: Effectiveness of a multidisciplinary approach to diabetic care involving pharmacists (MDCP) in managing hospitalized patients

Primary Author: Shi Ya Au Yong, National University Hospital; Email: shiya_auyong@nuhs.edu.sg

Additional Author (s):
Mun Yee Fong
Kai Xin Ng

Purpose: Diabetes mellitus is a chronic metabolic disorder characterised by hyperglycemia. Poor glycemic control, using glycated haemoglobin (HbA1c) as a marker, contributes significantly to microvascular and macrovascular complications, leading to increased morbidity and mortality. Studies have shown a positive impact of pharmacist-led management programmes in achieving glycemic control in diabetic patients in different settings, though there is a lack of studies on such programmes in the inpatient setting. This project aimed to evaluate the efficacy of a Multidisciplinary Approach to Diabetic Care Involving Pharmacists (MDCP) in managing hospitalised diabetic patients in a local tertiary hospital in Singapore.

Methods: A single-centre, retrospective cohort study was conducted on Type 1 or 2 diabetes mellitus patients managed under MDCP programme during their hospital admissions from 1 April 2014 to 31 June 2016. Data were obtained from electronic medical records as well as the National Electronic Health Record (NEHR). The primary outcome was a change in HbA1c levels from baseline to within 3 months post-discharge. Secondary outcomes included changes in HbA1c levels from baseline to minimum 1 year post-discharge as well as any diabetes-related readmissions within one month post-discharge. Descriptive statistics and paired samples T-test were conducted, with statistical significance shown by a p-value less than 0.05. This study was approved by Domain Specific Review Board (DSRB), National Healthcare Group (NHG) Singapore prior to initiation in 2016.

Results: A total of 348 patients were included in the final analysis. There was a statistically significant decrease in HbA1c levels at baseline to both timepoints at within 3 months and minimum 1 year post-discharge (p < 0.0005), with the mean HbA1c levels decreasing from 10.2 ± 2.6% at baseline to 7.9 ± 1.8% within 3 months and 8.6 ± 2.1% minimum 1 year post-
discharge. The number of patients with poorly-controlled diabetes (HbA1c more than 9%) decreased from 225 (65%) to 63 (18%) within 3 months post-discharge. Possible confounding factors such as blood transfusions and repeat visits were found not to affect the results of this study. A total of 14 patients (4.0%) and 9 patients (2.6%) were readmitted within 1 month post-discharge for diabetes-related and cardiovascular complaints respectively.

**Conclusion:** MDCP programme has shown to significantly improve glycemic control in hospitalised diabetic patients from baseline up to minimum 1 year post-discharge, though the impact of MDCP seems to decrease slightly over a longer follow-up period. This study shows the positive impact of a pharmacist-led programme, MDCP, in managing a diabetic population with multiple co-morbidities, poorer diabetes control and hence at higher risk of diabetes-related complications in the acute inpatient setting.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Clinical Services Management

**Session-Board Number:** 4-022

**Poster Title:** Antibiotic stewardship program supported by clinical surveillance increases pharmacy interventions and reduces costs

**Primary Author:** Sara Bassi, Ellis Medicine; **Email:** bassis@ellismedicine.org

**Additional Author(s):**
Tasha St. John

**Purpose:** In early 2016, our hospital's Pharmacy Department had policies and procedures in place for monitoring and dosing several antibiotics, but did not have a robust antimicrobial stewardship program. Recommendations from the New York State Department of Health spurred the hospital to develop a program, using a clinical surveillance system to help streamline the process and provide better documentation for follow up on patients. Another important consideration was new Joint Commission requirements for hospitals to have antimicrobial stewardship programs. After one year, the program has resulted in increased pharmacy interventions and cost savings due primarily to discontinued and de-escalated antibiotics.

**Methods:** In developing an antimicrobial stewardship program, our pharmacists found that they were not able to easily identify drug-bug mismatches, duplication of therapy, and opportunities for de-escalation or discontinuation of therapy using manual methods, which were time-consuming and labor-intensive. As a result, they adopted a clinical surveillance system (Premier’s TheraDoc) to help streamline and automate the process. The system was implemented for general pharmacy use for all patients, and also was separately tailored for antimicrobial stewardship using a set of standardized and customized alerts and interventions. The hospital initially focused on vancomycin, a challenging antibiotic that often requires dosing and continuous monitoring by pharmacists based on physician orders, and also meropenem, a broad-spectrum antibiotic with increasing antibiotic resistance. The clinical surveillance system was used to automate monitoring and improve coordination between shifts since dose adjustments may need to be made at any time. Interventions and cost savings were tracked, and began presenting results monthly at the Stewardship Committee meeting and quarterly at Pharmacy and Therapeutics Committee and Infection Control meetings. Cost savings for de-escalation and discontinuation of antibiotics were calculated by entering into the clinical surveillance system the number of days of therapy saved. During monthly data reviews, the
stewardship pharmacist refers to a spreadsheet with the price of the medications to calculate the cost savings for their interventions.

**Results:** From May 2016 to May 2017, the stewardship team completed 1,718 reviews. Resulting cost savings for discontinued and de-escalated antibiotics were about $55,091 for vancomycin and meropenem, and $67,305 for all antibiotics combined. In total, 130 cases were de-escalated for vancomycin and 200 for meropenem. An analysis of intervention types revealed that 23% were for antibiotic de-escalation, 11% for discontinuation, 6% for therapy adjustment, 4% for initiation or escalation of therapy, 1% for dose/interval adjustment, 1% recommended culture draw, and 1% recommended therapeutic drug monitoring. In addition, 53% of cases reviewed by the stewardship team required only monitoring and no direct intervention with the primary team covering the patient. Since January 2017, the hospital also has had access to an antibiotic indicator report focused on evaluating vancomycin and meropenem, looking at total courses of the drugs ordered, the physician group that ordered them, and the indication. It provides the percent of courses de-escalated or discontinued based on stewardship recommendations. In January 2017, the results were 15.4% de-escalated or discontinued for meropenem, increasing to 42.9% in May 2017. For vancomycin, in January 2017 the percentage of courses de-escalated or discontinued based on recommendations was 20%, increasing to 25% in May 2017.

**Conclusion:** At our hospital, the need to implement an antibiotic stewardship program was accompanied by challenges due to the time and manpower required for collecting and analyzing data. A clinical surveillance system helped streamline the process and ensure that pharmacists are alerted to opportunities for medication adjustments. The resulting increase in pharmacy interventions and cost savings demonstrates the value of the program and its ability to help ensure the appropriate use of antimicrobials. The facility is now able to identify and address patient safety concerns that may otherwise have been missed without a pharmacist going through every patient file every day.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-023

Poster Title: Pharmacy assisted admission medication histories and reconciliation: full hospital expansion

Primary Author: Kimberly Boothe, Yale New Haven Health; Email: kimberly.boothe@hotmail.com

Additional Author(s):
Katarzyna Szablowski
Sara Cohn
Lionel Picot-Vierra
Jessica Vigneau

Purpose: Medication reconciliation is an important safety and regulatory initiative. Despite many quality improvement efforts at Yale New Haven Hospital (YNHH), medication histories were complete approximately 50% of the time and medication discrepancies continued to occur. Published and pilot data reveal that a dedicated pharmacy resource, utilizing a standardized Best Possible Medication History (BPMH) technique and pharmacist review of reconciliation can improve safety and quality. The purpose of this research is to improve admission medication reconciliation through with expanded dedicated resources and standardized pharmacist assisted process.

Methods: A quality improvement project was undertaken following the approval of a business plan to expand resources to support admission medication histories by Medication History Technicians (MHTs) and reconciliation review by pharmacists. The hospital also enrolled as a study site for the Multi-Center Medication Reconciliation Quality Improvement Study (MARQUIS2) which allows for standardized data collection. The objective of this study was to reduce admission medication history and reconciliation discrepancies. The intervention group includes patients with medication histories taken by trained MHTs in the emergency department, via telephone for scheduled surgery admissions, or on the unit for direct admissions. The control group includes patients where a medication history is obtained by a nurse, physician, or advanced practice provider. MHTs use a standardized interview technique adopted from MARQUIS to obtain the best possible medication history and a pharmacist reviews and intervenes on discrepancies. A study pharmacist assesses the quality of histories and reconciliation through MARQUIS2 and collects data in a de-identified study database. The

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
primary outcome measure was the quantity of unintentional discrepancies in medication history and admission reconciliation. Secondary endpoints include the types of discrepancies, capture rate of medication histories by MHTs, discharge discrepancies, and provider satisfaction. The team utilized multiple quality improvement tools such as: project charter and action plan, Plan-Do-Study-Act (PDSA) cycles, process maps, and a peer mentor.

**Results:** Pharmacy assisted admission medication reconciliation is currently reaching 50% of admitted patients with recruiting and onboarding still occurring. The planned expansion timeline to reach 100% of patients by October 2017. 107 patients with a mean age of 65 were evaluated. There were 46 patients in the intervention arm on a mean number of 14.1 medications/patient and 61 patients in the control arm on a mean number of 10.8 medications/patient. The mean number of admission history discrepancies were reduced by 75% from 2.8 to 0.7 discrepancies/patient. The mean number of admission reconciliation discrepancies were reduced by 40% from 2 to 1.2 discrepancies/patient by the provider and further reduced to < 0.5 per patient with pharmacist reconciliation. The majority of discrepancies occurred during the medication history step (80%) compared to reconciliation step (20%) and the most common types were omissions (26%), frequency (25%), and dose (20%). The mean number of discharge reconciliation discrepancies were reduced by 50% from 1.3 to 0.6 discrepancies/patient. There was a 65% increase in provider satisfaction with 80% of providers being very satisfied or satisfied with no one being dissatisfied with the new process.

**Conclusion:** Admission medication reconciliation was improved through this pharmacy assisted process with dedicated pharmacy resources and a standardized process. The incorporation of medication history technicians and pharmacist reconciliation review resulted in a 75% reduction in admission discrepancies which equates to 3 less patients experiencing a medication error resulting in harm. The capture rate for pharmacy assisted medication reconciliation on admitted patients is on track to reach 100% upon completion of recruitment. Clearly defined roles by incorporating a dedicated pharmacy resource is beneficial. Discharge medication reconciliation was improved with admission intervention, but discrepancies continue and warrant further intervention and research.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-024

Poster Title: Effect of a pharmacy-led transitions of care program on heart failure readmission rates at a community hospital

Primary Author: Kyle Brown, Atlantic Health; Email: kyle.brown@atlantichealth.org

Additional Author(s):
Alan Chen
Natalie Erichsen
Rosana Shifan
Alekhya Uppala

Purpose: Heart failure readmissions are a burden on healthcare nationwide. Medication and disease state education are key factors in increasing patient compliance with their regimen and preventing readmissions. As part of a multidisciplinary team, Chilton Medical Center’s clinical pharmacy team began providing a transitions of care (TOC) service including: admission medication history, inpatient (medication and disease state) education, discharge counseling, and a follow-up phone call after discharge. The purpose of this study was to assess program quality and measure the effect of a pharmacy-led TOC program on the rate of heart failure readmissions in a community hospital.

Methods: This study evaluated two groups of patients from identical six-month periods in 2015 and 2016. A control group was comprised of patients from 2015, who did not receive TOC services, and an intervention group from 2016, who did. Inclusion criteria for this study was any adult inpatient with a primary diagnosis of congestive heart failure. Patients were excluded if they presented with any other primary diagnosis, were admitted from a skilled nursing facility, or expired during hospitalization. The intervention group included patients who completed any component of the TOC program. The primary endpoint of this study was all cause, 30-day readmission. Secondary analysis of each individual component of the TOC program was also evaluated. All data was de-identified and stored on a password protected computer. Data analyzed included patient demographics, primary diagnosis, and completed components of the TOC program.

Results: A total of 230 patients met criteria for the study: 131 patients in the control group and 99 patients in the intervention group. Thirty-day readmission rates were 19.8% and 16.1% for...
2015 and 2016, respectively. This demonstrates a relative reduction in readmission rate of 18.6%. Patients who completed at least one component of the TOC program - inpatient education, discharge counseling, or post discharge follow-up had readmission rates of 16.3%, 16.6%, and 18.75%, respectively. Patients who completed at least 2 components had the following readmission rates: 16.6% for inpatient education and discharge counseling, 18.8% for inpatient education and post discharge follow-up phone call, and 19.5% for discharge counseling and post discharge follow-up phone call.

**Conclusion:** There is substantial evidence to support the use of a pharmacy-driven TOC program to decrease readmission rates in heart failure patients. Subgroup analysis shows that direct face-to-face interaction with a pharmacist, including inpatient education and discharge counseling, had the greatest effect. This study corroborates previously published literature and supports expanding this clinical pharmacy service in order to provide education and counseling to all patients with heart failure diagnosis.
Submission Category: Clinical Services Management

Session-Board Number: 4-025

Poster Title: Assessment of the impact of pharmacy learners on essential patient care processes

Primary Author: Matthew Chow, University Health Network; Email: matthew.chow@uhn.ca

Additional Author (s):
Philip Lui
Karen Cameron
Bassem Hamandi
Olavo Fernandes

Purpose: Currently there is a lack of published data examining the impact of pharmacy learners on patient care outcomes. A collaborative of hospital pharmacists established consensus on eight clinical pharmacy key performance indicators (cpKPIs) representing essential patient processes of care. The implementation of cpKPI measurement, along with the increased presence of learners from the expansion of entry-to-practice PharmD experiential programs, creates an opportunity to quantify pharmacy learner contribution to care. Therefore, the purpose of this study was to determine if the presence of pharmacy learners partnering with pharmacists is associated with an increased number of patients receiving cpKPI care processes.

Methods: This was a prospective, multi-centred, observational study at University Health Network (UHN) in Toronto, Canada. From January 25th to July 17th 2016, all pharmacy learners who were present at a six-site tertiary care health system for five week inpatient, direct patient care advanced pharmacy practice experience (APPE) rotations and their respective pharmacist preceptor or co-preceptors were included. Learners and their pharmacist preceptors tracked cpKPIs in the electronic patient record for the duration of their APPE rotations and the pharmacist preceptors tracked cpKPIs for the remainder of the study period. cpKPI data were compared during timeframes when a learner was present (intervention) to when a learner was not present (control). The primary endpoint was the number of patients receiving the admission medication reconciliation cpKPI. The secondary endpoints were the number of patients receiving other select cpKPIs (pharmaceutical care plan, patient education during hospital stay, patient education at discharge, and medication reconciliation at discharge). Statistical comparisons for the primary and secondary cpKPI endpoints were conducted using the Wilcoxon Signed Rank Test and statistical significance was determined with a 2-sided alpha.
level of 0.05. A post-rotation survey was administered to determine pharmacist and learner perspectives on pharmacy learners partnering with pharmacists to deliver cpKPI processes of care. This study was approved by the institutional review board.

**Results:** In the main analysis of 30 learner-pharmacist pairs with 4684 patients, 1136 patients received admission medication reconciliation in the intervention group compared to 887 patients in the control group (normalized for 5 weeks). The number of patients receiving admission medication reconciliation per 5 weeks was significantly increased when a pharmacy learner partnered with a pharmacist (median = 29) compared to a pharmacist alone (median = 24), with a median difference of 5 additional admission medication reconciliations performed with a learner present (IQR= -1 to 6.9, p=0.0001). Due to low numbers of pharmacists and learners tracking the secondary endpoint cpKPIs, statistical analyses could not be conducted. In the post-rotation survey, 58 percent of pharmacists (15/26) and 84 percent of learners (16/19) agreed that learners partnering with pharmacists increased the delivery of cpKPI pharmacy services.

**Conclusion:** Learners made a meaningful contribution to patient care and may act as ‘care-extenders’ to influence the number of patients receiving cpKPIs.
Submission Category: Clinical Services Management

Session-Board Number: 4-026

Poster Title: Implementation of heart failure readmission prevention program across a national health system

Primary Author: Lynn Eschenbacher, Ascension; Email: lynn.eschenbacher@ascension.org

Additional Author (s):
Mohammed Abdulwahhab

Purpose: Heart Failure impacts over 5.8 million people in the United States, with over 1 million hospital admission yearly. The Ascension pharmacy team, which covers over 140 hospitals, developed a national program to prevent heart failure readmissions. A national decision team developed best practices and a toolkit that can be utilized by any hospital regardless of size in order to optimize patient care while minimizing operational workflow impact. While the practices developed are specific to heart failure, the processes of development and implementation may be utilized in a variety of service line and disease states.

Methods: Ascension set a goal to decrease the overall heart failure readmission rate by 4% by the end of FY17. Pharmacy took responsibility for performing patient counseling, polypharmacy review, and ensuring access to medications, as well the optional goal of conducting post-discharge pharmacy follow-up. A national decision team developed best practice guidelines and toolkits to assist with the implementation of this program. The Decision Team compiled evidence-based practices for clinical management of the disease, patient education, providing access to medication, and post-discharge follow-up and created a toolkit that was posted on the intranet. The Decision Team also recommended implementation strategies that take into account optimizing the use of students and residents, limitations in staffing capabilities, as well as other operational and financial considerations often faced by health care institutions. Continuing educations sessions were conducted to address the clinical management of heart failure as well as patient counseling technique to improve pharmacists’ skill in clinical competency and education delivery for the patients. Monthly coaching calls were conducted to share best practices between the hospitals and answer questions. Also, a Clinical Decision Support (CDS) tool was utilized to help identify patients who are admitted for heart failure and allowed for standardized documentation of pharmacy interventions as well as a method to collect and share data on a national level through a National Dashboard.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: Prior to the end of the fiscal year of the 111 hospitals eligible for implementation, 92% (n=101) of hospitals have implemented or in progress to complete the implementation of discharge counseling, polypharmacy management, and ensuring medication access for patients. To test the data collection process 3 pilot sites were selected which demonstrated in the first 3 months the rule identified 1743 patients, 1220 were estimated to have heart failure, and 639 patients that were counseled with 300 interventions made. During the pilot months, the 30-day hospital readmission rate for the piloted hospitals has decreased from 14.74% to 11.93% (ARR 2.81%, RRR 20%) when compared to identical months from the previous year prior to implementation. Additional updated data from the national dashboard will be included in the poster.

Conclusion: Pharmacy can have a significant impact on the reduction of readmissions through discharge counseling, polypharmacy management, and ensuring medication access for patients. While the decrease in readmission rate cannot be solely attributed to pharmacy interventions, at the 3 pilot sites there were 300 interventions documented and over 639 patient counseling sessions. Results from the entire Health-System from the National Dashboard will be shared in the poster. Further evaluation will assess the difference in readmission rates for those who received counseling compared to those who missed that opportunity for pharmacy evaluation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Clinical Services Management

Session-Board Number: 4-027

Poster Title: Impact of a bedside medication delivery program at a community-based academic medical center

Primary Author: Halley Gibson, Lahey Hospital and Medical Center; Email: halley.c.gibson@lahey.org

Additional Author(s):
Phung On

Purpose: Upon discharge, patients frequently leave the hospital with a new or entirely different medication regimen. Filling prescriptions after leaving the hospital can be difficult for patients due to numerous obstacles, including lack of transportation, timeliness of filling discharge medications, and insurance restrictions. These scenarios can proactively be handled by a bedside medication delivery program prior to discharge, and ultimately reducing the potential for a delay in care. The purpose of this study was to determine the impact of a quality improvement project aimed at developing and implementing a discharge bedside medication delivery pilot program at a community-based academic medical center.

Methods: This is an IRB-approved retrospective chart review of a quality improvement pilot program, which focused on developing and implementing a bedside medication delivery program at a community-based academic medical center. Patients were included if they were at least 18 years or older, admitted to the inpatient cardiology unit, and discharged with new prescriptions during the 4-week pilot program. Patients were excluded if they were not discharged to home, not expected to manage their own medications, discharged on weekends or after program hours, discharged with prescriptions that were unable to be filled at the hospital’s outpatient pharmacy, or left against medical advice. Data was analyzed to determine the impact on outcomes and financial requirements associated with program operations.

Results: Prior to the implementation of a discharge bedside medication delivery pilot program, less than 10% of overall discharge prescriptions were captured by the outpatient pharmacy. During the pilot, 5 patients (38.5%) agreed to receive discharge medications from the bedside medication delivery program. Of those 5 patients, 13 new prescriptions (44.8%) were filled in the outpatient pharmacy. Staffing resources from inpatient pharmacy, outpatient pharmacy,
inpatient nursing, and inpatient physician groups were required to implement this pilot program.

**Conclusion:** Although the pilot program introduced new patients to the outpatient pharmacy, it did not show an overall significant change in prescription volume. Nevertheless, the pilot program was associated with positive net revenue. Significant barriers to program success included variations in inpatient unit and service based care, resource constraints, patient identification, and patient agreement. In addition there was inconsistency in provider referrals to the bedside medication delivery program. From this pilot program it was identified that an effective and optimal bedside medication delivery program requires a multidisciplinary approach and buy in from patients.
Submission Category: Clinical Services Management

Session-Board Number: 4-028

Poster Title: Implementation and evaluation of a team-based pharmacy practice model in a community health system

Primary Author: Taylor Gill, Via Christi Hospitals Wichita, Inc; Email: taylor.gill@ascension.org

Additional Author(s):
Luciana Thornton
Todd Schroeder
Kenneth Utz
Charles Gerlach

Purpose: In January 2016, in response to the national Pharmacy Practice Model Initiative/Pharmacy Advancement Initiative, a transition from a staff-specialist to a team-based pharmacy practice model was implemented within the pharmacy. The overall goal of the model change was to enhance the pharmacist’s clinical roles and further integrate pharmacists into the healthcare team. Specific goals of the new model were to increase the quality of pharmacist patient care, expand pharmacist drug therapy management to all inpatients, increase pharmacist accessibility to other health disciplines, advance the roles of technicians and assist in attaining institutional goals.

Methods: Before implementation of the new staffing model, a formalized metric evaluation process was created. The aim of this metric evaluation was to gauge model success, determine areas of model revision and objectively communicate pharmacist impact. Metric points were selected to align and evaluate the original goals of the new team-based pharmacist staffing model. Objective metrics were evaluated pre model implementation and then quarterly post model implementation for one year. In addition, surveys were distributed to pharmacists, physicians, nursing and administration both pre and post model implementation. Descriptive statistics were used for data analysis.

Results: At one year post model implementation, pharmacist to patient bed ratio decreased from 1:87 to 1:47, the number of rounds/huddles with pharmacist attendance increased by 63 percent to 80 per week, and the number of clinical interventions and new clinical consults increased from 57 to 62 and from 12 to 16 per day respectively. Non-formulary medication use also decreased from 1.77 to 0.623 per 1000 patient days and compliance with therapeutic
initiatives increased from 77 to 91 percent. Overall, 72 percent of pharmacist survey responses indicate they are satisfied with the model change. The majority of pharmacists, 81 percent, believe the model change has increased clinical activities and 84 percent believe the model change has led to improvement in patient care. Physician survey response indicated increased weekly pharmacist interaction from 41 to 49 percent and expanded use of pharmacist clinical services. Nursing survey results also improved with 30 percent of nursing responders indicating that pharmacist access has increased and the use of pharmacists had shifted from an operational to a clinical resource in the team-based model.

**Conclusion:** This metric evaluation demonstrated the successful implementation of a team-based pharmacy staffing model. Metric data showed improvement in clinical and operational endpoints and enhanced pharmacist, physician and nursing satisfaction. No changes to the team-based model were determined to be needed. These results were shared with the pharmacy staff and hospital administration to objectively promote pharmacist impact.
Submission Category: Clinical Services Management

Session-Board Number: 4-029

Poster Title: Clinical pharmacist training standardization for newly hired pharmacists at an academic medical center

Primary Author: Abby Kim, Children's Hospital Colorado; Email: abby.kim@childrenscolorado.org

Additional Author(s):
Kirsten Petty

Purpose: Clinical pharmacists have more advanced training and experience than ever before with advancement of clinical pharmacy training during pharmacy school and post-graduate residency and fellowship training. However, clinical pharmacy practice varies by institution. Standardized training for newly hired pharmacists within an institution is vital to ensure quality clinical training specific to the institution, despite what a trainee may experience during the training period. This project was designed to standardize clinical training across all clinical services to equip newly hired pharmacists with institutional knowledge and resources to succeed and meet hospital regulatory requirements.

Methods: A clinical pharmacist with extensive experience within the department led the project by creating a standardized pharmacist orientation checklist and training guideline for each clinical service within the department. The standardized form for each clinical service was created in collaboration with the clinical pharmacy specialist and further reviewed and revised by the focused float pharmacist team. The pharmacist orientation checklists and training guidelines were revised only by the lead pharmacist and stored within a shared department folder in portable document format for access. The pharmacist orientation checklist and training guidelines were updated on a biannual basis. Each newly hired pharmacist was given the applicable pharmacist orientation checklists and training guidelines on their first day and returned to their supervisor or manager for regulatory documentation when training was completed.

Results: A pharmacist clinical orientation checklist and training guideline containing various sections based on clinical service was created for each clinical service within the department (i.e. emergency department, pediatric intensive care, oncology, stem cell transplant, pulmonary, solid organ transplant). Sections included unit orientation, clinical policies and

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
procedures, clinical pathways, order sets, documentation requirements, disease state management, electronic medical record requirements and other sections specific to the clinical service. Implementation of the project and use of the pharmacist orientation checklists and training guidelines were put into fruition with an incoming pharmacy resident class and with each new hire to the department. Feedback was solicited from trainees via questionnaire on effectiveness of the pharmacist orientation checklist and training guideline immediately after training completion and three and six months after training completion.

**Conclusion:** Creation and implementation of standardized clinical pharmacist training using pharmacist orientation checklists and training guidelines led to standardized training for all newly hired pharmacists and improved quality of training within an academic medical center while meeting regulatory requirements.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-030

Poster Title: Risk prediction model of 30-day hospital readmissions for patients with heart failure

Primary Author: Daniel Kudryashov, Keck Hospital of USC; Email: daniel.kudryashov@med.usc.edu

Additional Author(s):
Sang Kyu Cho
Yuna Bae
Jeffrey McCombs

Purpose: The risk factors associated with 30-day hospital readmissions for patients with heart failure (HF) are unclear, especially the role played by pre-admission and discharge medication therapy. This study evaluates the factors associated with 30-day hospital readmission for HF patients. Risk prediction models are often used to identify characteristics of high-risk patients to design future interventions aimed at reducing readmissions.

Methods: Electronic medical records data were collected for patients with a principal discharge diagnosis of heart failure from the Keck Medical Center of University of Southern California. Patient demographic, medical history, medications on admission and discharge, payer type, vitals during admission and lab values were retrieved for the analysis. These data were compared across patients with and without all-cause 30-day readmission using descriptive statistics. A parsimonious logistic regression model was estimated to identify significant predictors of readmission.

Results: 604 HF patients met study inclusion criteria. Ninety-two (15 percent) were readmitted within 30 days. Statistically significant risk factors correlated with a 30-day readmission included: male gender [OR 1.91 (1.07-3.40)], being of Hispanic origin [OR 1.69 (0.99-2.89)], diabetes mellitus [OR 1.57 (0.96-2.58)] and end-stage renal disease [OR 2.29 (1.07-4.91)]. Being single and widowed were also associated with higher risk of 30-day readmission, but were not statistically significant. Being divorced was associated with lower risk of readmission [OR 0.42 (0.20-0.89)]. The readmission risk was significantly lower among patients with more than 10 medications on admission [OR 0.43 (0.19-0.95)], and it was even lower among patients with more than 15 medications on admission. [OR 0.26 (0.10-0.67)]. Of all evidence-based HF
medications at discharge tested in our model, only loop diuretic dose on discharge was significantly correlated with 30-day hospital readmission. However, it was not included in the parsimonious model due to its correlation with end stage renal disease. Finally, patient age at admission was not significantly correlated with readmission risk once other factors were included in the model.

**Conclusion:** We developed a practical, predictive model to identify the risk factors associated with 30-day readmission in HF patients. Our model can guide the design of targeted interventions to reduce the rates of early hospital readmission among high-risk patients. Given the combination of social and medical factors associated with an early readmission, our results highlight the need for an inter-disciplinary approach to transitions of care services to optimize pharmacotherapy and HF patient population management.
Submission Category: Clinical Services Management

Session-Board Number: 4-031

Poster Title: Evaluation of pharmacist's interventions in medical intensive care unit

Primary Author: Suna Lee, Ajou University Medical Center; Email: leesa104@hanmail.net

Additional Author(s):
Young Hee Lee

Purpose: It is a known fact that the pharmacist’s participation in ICU patient care have a good influence. Ajou university hospital has been conducted in pharmacotherapy intervention activities since September, 2013 by pharmacists participating in the rounds of medical intensive care unit. From September 2013 to December 2016, we classified and analyzed contents of the pharmacist's intervention in medical intensive care unit.

Methods: The number of interventions, intervention accept rate, and intervention contents were summarized based on the pharmacist intervention records conducted for ICU patients between September 2013 and December 2016. The number of questions asked by doctors and nurses between September 2013 and December 2016 analyzed separately.

Results: The number of interventions was 144 from September to December 2013, 560 in 2014, 654 in 2015, and 877 in 2016. The intervention accept rates were 93.3%, 94.2%, 98.4% and 97.5% respectively. Therapeutic drug monitoring (TDM) was the most common intervention (53%), followed by the dosage regimen & indication intervention (22%). Among the dosage regimen & indication intervention, initial dosage information and indication information at the start of drug use were most frequently provided, followed by dose reduction, increased dose, and dose adjustment when applying renal replacement therapy. The medication of most frequent intervention was antibiotics (68%), followed by nutrition (6.8%), low molecular weight heparin (3%), stress ulcer medication (3%) and electrolyte and fluid (2.5%). The number of doctors and nurses' question was 66 in 2013 from September to December 2013, 218 in 2014, 351 in 2015, and 500 in 2016.

Conclusion: The number of prescription interventions and questions has been increasing every year since the pharmacist in the ICU has participated in the rounds. Based on this, it is a future direction to study the economic effects of pharmacists’ intervention services.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Clinical Services Management

Session-Board Number: 4-032

Poster Title: Impact of pharmacist’s presence in wards on nursing and patient care

Primary Author: Abdulmohsin Marghalani, Security Forces Hospital Makkah; Email: pharmalani@gmail.com

Purpose: Clinical pharmacy services have allowed more integration with other team members that focus more on patients while admitted in wards. Pharmaceutical services in the floors have been delivered mainly by highly qualified clinical pharmacists in Saudi Arabia. Pharmacists without postgraduate studies also possess some degree of clinical knowledge as well. This also increases with their hospital work and experience. The purpose of this study was bridge the shortage of qualified clinical pharmacists and the great need for pharmacists in wards. Basic services in the floor such as medication reconciliation, discharge counseling and interventions will be delivered.

Methods: An observational study using a descriptive cross sectional questionnaire was prepared. This was piloted by five nursing staff. The questionnaire was sent to nursing staff’s emails within the hospital. A five point likert scale was used for responses. Questions were specific and related to the services provided by the floor pharmacists two months after their presence in the wards.

Results: 88 nurses responded to the questionnaire. They were representing different wards in the hospital. Communication between the two departments have enhanced by 80%. There was an agreement by 60% of nursing that their phone calls were reduced to the pharmacy with the presence of floor pharmacists. Almost 70% of nursing have agreed that discharge counseling for medications were handled better with floor pharmacists. 76% of nursing staff agreed that discontinuation of floor pharmacists will affect their work. Only 5.7% have disagreed that floor pharmacists have allowed more time for nursing to focus on their patients.

Conclusion: The results were in favor for the continuation of the floor pharmacist services. This was clearly stated by nursing staff responses which ultimately reflect a better care for patients. Presence of floor pharmacists have proven to be highly regarded by the nursing staff. This model can be used by countries where highly qualified clinical pharmacists are not present, yet their hospitals require pharmacists inputs in the floors. Decentralising pharmacists not only
clinical ones would be a wise option for a better teamwork and patient safety and experience. Focused studies on each ward are also needed to deliver better pharmaceutical services.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Clinical Services Management

**Session-Board Number:** 4-033

**Poster Title:** Augmentation of pharmacist clinical services through implementation of decentralization and the care team conference process

**Primary Author:** Laura McElroy, Maury Regional Medical Center; **Email:** lmcelroy80@comcast.net

**Additional Author(s):**
Erika Hasford

**Purpose:** Purpose: The pharmacist’s role in medication management has become increasingly important as drug regimens become more complicated and medical costs rise. Maury Regional Medical Center utilized LEAN methodology to implement a new process, called Care Team Conference, in 2014. The Care Team Conference was designed to improve patient care, efficiency, and communication among providers through a multi-disciplinary daily meeting to discuss patients. A pharmacist was added to each Care Team. The purpose of this study was to evaluate the additional impact on patient care via clinical interventions, as well as cost savings a pharmacist could provide in this new role.

**Methods:** Methods: The Care Team Conference was implemented using a standard workflow developed utilizing the LEAN process, with a pharmacist participating in the team. Data was gathered for a one year period from January 1 to December 31, 2016 to compare clinical interventions made by one pharmacist who has a hybrid position (approximately 50% of hours worked in a clinical position on the ICU Stepdown Unit (“on the floor”), and approximately 50% of hours worked in a traditional role in the main pharmacy). The interventions were documented daily in the pharmacy computer system. Those interventions accomplished during Care Team Conference were notated in the system. Customized clinical surveillance software was utilized to alert the pharmacist about additional situations requiring intervention, and estimate cost savings. The pharmacist’s interventions were analyzed for the type and quantity performed in each role (on the floor versus in the main pharmacy), the number done during Care Team Conference, and cost savings achieved.

**Results:** Results: A total of 31 different types of pharmacist interventions were evaluated. The pharmacist documented 5,122 interventions over the course of the year. Of these, 4,252 were performed on the floor, 870 in the main pharmacy. A total of 1,101 patients were reviewed.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
during the Care Team Conference process, with 204 clinical interventions made by the pharmacist during those meetings. Of note, many types of interventions were performed a similar number of times whether the pharmacist worked on the floor or in the main pharmacy. However, many additional types of interventions were able to be performed only when the pharmacist worked on the floor, including a daily medication profile review for all patients, patient/caregiver education, and patient/caregiver interviews to perform medication reconciliation. Additionally, the improved accessibility of nurses, prescribers, and pharmacists to one another led to increased communication, which undoubtedly gave rise to many positive interventions. An estimated $123,101 in cost savings/avoidance was achieved during the year through the pharmacist’s work in the decentralized role on the floor (approximately 20 hours per week).

**Conclusion:** A review of one pharmacist’s clinical interventions performed over 365 days overwhelmingly suggests participation in Care Team Conference and decentralization has increased the number and types of interventions performed by pharmacists. It has improved relationships between members of the healthcare team, leading to increased teamwork and efficiency, and has resulted in significant cost savings. This study strongly indicates these increased pharmacist roles are contributing to improved quality of care for patients at Maury Regional Medical Center. These results affirm that further studies should be undertaken to analyze how these pharmacist interventions affect patient outcomes.
Submission Category: Clinical Services Management

Session-Board Number: 4-034

Poster Title: Impact of pharmacist resources to the perioperative surgical home in elective total joint arthroplasty patients

Primary Author: Kelsea Mizusawa, The Daniel K. Inouye College of Pharmacy at the University of Hawaii at Hilo; Email: kaylm@hawaii.edu

Additional Author(s):
Kellie Octavio
Shanele Shimabuku
Laura Ota
Joy Matsuyama

Purpose: The perioperative surgical home (PSH) is a surgical care model that promotes a proactive, coordinated, and interdisciplinary team-based approach to the surgery process in order to improve patient outcomes and reduce hospital costs. Although the role of pharmacists in the PSH has been documented, the literature describing clinical outcomes is limited. The purpose of this evaluation is to determine if pharmacist presence in the PSH has an impact on patient outcomes for patients undergoing elective hip or knee arthroplasty.

Methods: In February 2017, a pharmacist was added to the perioperative surgical home, which was mainly comprised of orthopedic surgeons, anesthesiologists, and nurses. The PSH pharmacist was placed in the pre-operative clinic two days a week to interview patients scheduled to undergo elective hip or knee arthroplasty by a single orthopedic surgeon. During the pre-operative clinic appointment, the pharmacist performed medication reconciliation to obtain an accurate medication list; made adjustments to the patient’s perioperative anticoagulation, deep vein thrombosis prophylaxis, and pain management regimens; and coordinated care for other chronic disease states. Post-operatively, the pharmacist optimized anticoagulation and pain management regimens, addressed any other pertinent issues, and provided discharge education on medications. A retrospective chart review of adult patients undergoing elective hip or knee arthroplasty by a single orthopedic surgeon was completed for a 2.5 month period before (December 1, 2016 - February 13, 2017) and after (February 14, 2017 - April 30, 2017) a pharmacist was placed in the PSH. Outcomes assessed include patient demographics, hospital length of stay, medication reconciliation completion and accuracy, post-
operative opioid use, pharmacist interventions, discharge medication education, and 30-day readmission rate. This project was deemed exempt from institutional review board review.

**Results:** A total of 181 patients undergoing elective hip or knee arthroplasty were reviewed; 93 patients prior to the implementation of a PSH pharmacist (baseline group) and 88 patients after the implementation of a PSH pharmacist (pilot group). Baseline demographics were similar between the two groups. Compared to the baseline group, the pilot group had a decrease in length of stay (1.80 versus 1.57), and an improved rate of medication reconciliation completion (60.2% versus 95.5%) and medication reconciliation accuracy (28.6% versus 98.8%), respectively. Opioid consumption was measured using morphine milligram equivalent units. Compared to the baseline group, the pilot group had a lower mean opioid use during hospitalization (24 mg versus 18.7 mg, respectively) and patients were discharged on less potent opioid medications. In the pilot group, pharmacist interventions were made in 67% of patients. A total of 108 interventions involving discharge disposition, pain management, deep vein thrombosis prophylaxis, anticoagulation, and other chronic disease states were completed with improved communication across the patient care team. Since discharge medication education started in March 2017, education was provided to 100% of patients. Compared to the baseline group, the 30-day readmission rate was lower in the pilot group (2.2% versus 0%, respectively).

**Conclusion:** Integrating a pharmacist into the perioperative surgical home was associated with a lower hospital length of stay, higher rate of medication reconciliation completion and accuracy, and reduced mean opioid use during hospitalization. The PSH pharmacist made a significant amount of medication-related interventions and increased communication to both the patient and care team during all phases of the operative process. The PSH pharmacist pilot service will be continued with possible expansion to other orthopedic surgeons and other surgical specialties.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-035

Poster Title: Development of insulin-dosing-per-pharmacy service: progress and clinical outcomes

Primary Author: Thao Nguyen, Adventist Health White Memorial; Email: nguyentd@ah.org

Additional Author(s):
Catherine Van

Purpose: In acute care setting, adverse outcomes including death result from both hyperglycemia and hypoglycemia. ADA 2017 guideline recommends a target blood glucose (BG) range of 140 to 180 mg/dL for majority of non-critically-ill hospital patients with persistent hyperglycemia. Hypoglycemia that needs treatment and dose adjustment is defined as BG values less than or equal to 70 mg/dL. Clinically significant hypoglycemia is less than 54 mg/dL. Clinical pharmacists have provided both insulin-monitoring and insulin-pharmacy-to-dose (IPD) services for non-ICU patients since September 2014. This project reviewed and described the process and development of IPD service over time and assessed its clinical outcomes.

Methods: The IPD process had 3 phases in development. Phase I was for preparation with a root cause analysis being conducted to identify risk factors. An IPD protocol was developed. All clinical pharmacists were trained and assessed for competency followed by a pilot process. Phase II was for implementation. A daily list of patients with BG greater than 200 mg/dL or less than 70 mg/dL was generated for clinical pharmacists to review, who would contact prescribing physicians for interventions as necessary. An endocrinologist was available for consult in complex cases. Data from 51 IPD and 59 non-IPD patients were extracted for review. Phase III was for practice establishment. Pharmacy protocol was revised to authorize pharmacists to make dosage adjustment of the subcutaneous insulin therapy if prescribing physicians did not intervene within 24 to 48 hours. Data from 40 patients in each group, IPD and non-IPD, were extracted for assessment. Progress and clinical outcomes from the IPD process were described.

Results: Phase I: Factors of good glycemic control included meal intake documentation, antiglycemic therapy, baseline A1c, timing of insulin dosage adjustment and administration, age, weight, steroid therapy and renal function. Phase II: The total daily insulin dose (TDD) at discharge was 0.34 units/kg in the IPD group (51 patients) and 0.38 units/kg in the non-IPD group (59 patients). Average BG reduction was 17 percent and hypoglycemia was 11.8 events

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
per 100 patients in the IPD compared to 22 percent and 15.3 events in the non-IPD group. Phase III: TDD and average BG reduction were 0.53 units/kg and 50.5 mg/dL respectively in the IPD group (40 patients) compared to 0.33 units/kg (P 0.002) and 24.7 mg/dL (P 0.047) in the non-IPD group (40 patients). Ninety percent IPD patients were on guideline-recommended regimen with nutritional, correctional and basal insulins compared to 42.5 percent in non-IPD patients (P 0.001). There were 12.5 hypoglycemic events per 100 patients in the IPD group (0.47 percent) compared to 27.5 events in the non-IPD group (0.9 percent. P 0.23). For clinically significant hypoglycemia, there were 5 events per 100 patients in the IPD group (0.19 percent) compared to 17.5 events in the non-IPD group (0.57 percent. P 0.27).

**Conclusion:** It took time, efforts and protocol adjustments in the development of insulin-dosing-per-pharmacist service to progress with better outcomes. The pharmacists became familiar with the IPD practice, and were able to provide guideline-driven subcutaneous insulin dosing service safely.
Submission Category: Clinical Services Management

Session-Board Number: 4-036

Poster Title: Pharmacy care transition service: a comprehensive medication management program, progress and clinical outcomes

Primary Author: Thao Nguyen, Adventist Health White Memorial; Email: nguyentd@ah.org

Additional Author (s):
Lan Nguyen

Purpose: Studies found that 15 to 25 percent of hospital’s general discharge patients and 36 to 43 percent of the high risk patients were readmitted within 30 days. Major risk factors included high age, previous readmission within 30 days, comorbid chronic medical conditions, polypharmacy and lack of medication education. About 50 percent had no physician visit before readmission. In a 353-bed teaching community hospital, the Pharmacy department designed a comprehensive medication management (CMM) program to provide optimal therapeutic services for those high risk inpatients and outpatients using a team-based approach that focused on practice guideline-directed therapy, patient education and medication adherence.

Methods: In an effort to reduce rates of hospital readmission, a hospital multidisciplinary care transition team comprised of a physician, a care transition nurse, a pharmacist, a respiratory therapist and a case manager met weekly to review a list of those patients with high risk factors. The pharmacy care transition team, comprised of a pharmacist, a pharmacy resident and a pharmacy intern, provided CMM service during the hospital stay, at discharge and post-discharge follow-up. The service included optimal medication therapy, dose adjustment, medication reconciliation, discharge patient counseling, free-of-charge health monitoring devices, smartphone programing for medication dosing time, medication access, follow-up phone calls, post-discharge visits, etc. Primary outcomes of readmission rates at 30 and 60 days were retrospectively reviewed after 6 months of service using data from a sample of 50 patients of the care transition team’s list and data from 50 patients of the computer-generated high risk list. Secondary outcome was the percentage of patients who had appropriate guideline-directed drug therapy at discharge. Main baseline data included patient demographics, chronic diseases, and number of maintenance medications.

Results: The review showed the hospital readmission rates for high risk patient population at 30 days and 60 days in the study group were 26 percent and 32 percent respectively, and were 46
percent and 54 percent in the control group respectively (P equal to 0.049 for the 30-day rate and 0.042 for 60-day rate). The hospital’s general readmission rate was 7.4 percent. Therefore, the rate of readmission at 30 days from the control group was 6.2 times higher, and the study group was 3.5 times higher than that of the general hospital population. For the secondary outcome, 76 percent of the study group had guideline-directed drug therapy at discharge while the control group was at 58 percent (P value was not measured).

**Conclusion:** Rates of hospital readmission in the high risk patient population were several folds higher than those of general patient population. The hospital care transition program that was enhanced by the pharmacy care transition service had significantly lower rates of readmission in that high risk patient population. Pharmacist’s participation in the service was associated with a higher number of practice guideline-directed therapies for chronic medical conditions, which could in part attribute to the decreased rates of readmission.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Purpose: The hospital management has key figures that concerns medication reviews (MR) during admission and medication reconciliation at discharge. Since the management at the surgical department has realized that their core competence is surgery, they have initiated cooperation with the clinical pharmacy department in order to reach the drug related key figures. The clinical pharmacists have developed great competences within the treatment of medical patients, whereas the surgical patients were unknown territory. Hence we wanted to develop and implement clinical pharmaceutical services that met the surgical department’s needs.

Methods: In 2014 pharmaconomists started making medication reconciliation prior to surgery, in order to assure correct medication during admission. The service was already well implemented at other wards at the hospital and did not need further adjustment - implementation was easily done. In March 2016 MR was introduced at the ward for lower gastro-intestinal surgery. The service was welcomed, and was extended to two other wards in October 2016. During the implementation phase it became clear that the method for MR at a surgical ward should not be identical to the method we used at the medical wards. The surgeons were not used to journal notes from pharmacists, hence we needed to mingle and be visible in order for them to realize our competences and know who we were. We evaluated our intervention proposals via a DRP database in order to optimize the MR for surgical patients. The service was continuously evaluated with the department head nurse and surgeons in order to optimize the service for the surgical department. As well the services were evaluated the clinical pharmacists in between, in order to keep track, leading to the same focus areas.

Results: During implementation it was realized that one-size does not fit all. The MR was adjusted to fit an abdominal surgical ward and what the surgeons found relevant according to the findings in the DRP database and the oral response from the staff. The focus was changed from a broad MR to a more narrowed focus on dose adjustment, kidney function, antibiotic- and analgesic rational pharmacotherapy. Numbers from the DRP database showed that intervention suggestions increased over 4 month period in the following areas: Double
treatment, ATC N (0% to 6% of the overall intervention suggestions), inappropriate choice of drug, ATC M (2% to 7%), supplement to treatment, ATC A (4% to 10%) and change of drug formulation, ATC J (2% to 8%). The clinical pharmacists have been invited to participate in the medical council with the surgical management. By this we contribute to continue developing the surgical department’s needs and challenges. The fact that the clinical pharmacists are at the wards every day automatic contributes to visibility and hence more focus on medication. The surgeons and the nurses can easily reach the pharmacist in case of questions.

**Conclusion:** Implementation of clinical pharmacy cannot necessarily be transferred from one department to another. When the cooperation with the surgical department was initiated, we thought that we could use our knowledge from the medical wards, but entering the surgical world taught us that one-size does not fit all. We had to change our mindsets in order to successfully implement clinical pharmacy at the surgical department. Using dialog with the department management, analysis of intervention suggestions and mingling with the surgeons and nurses, it became possible to adjust the services to fit the department’s needs. The implementation of services is fortunately ongoing.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-038

Poster Title: A cost-effectiveness analysis: an integrated medication therapy management with point of care CYP2C19 guided antiplatelet treatment services in patients after percutaneous coronary intervention (PCI)

Primary Author: Arinze Nkemdirim Okere, Florida A&M University; Email: arinzechukwu.okere@famu.edu

Additional Author(s):
Kyrian Ezendu
Abrahamane Berthe
Vakaramoko Diaby

Purpose: The goal of this study is to determine the best strategy to improve outcomes among patients who underwent percutaneous coronary intervention (PCI). In some studies, point-of-care CYP2C19 genotype-guided selection of antiplatelet (POCP) was more cost-effective than either universal use of ticagrelor or universal use of clopidogrel. However, no study has evaluated the cost-effectiveness of a pharmacist integration of medication therapy management (MTM) and POCP [MTM-POCP] when compared to universal ticagrelor or clopidogrel. Our objective in this study is to evaluate the cost-effectiveness of MTM-POCP in a health care system as compared to either MTM or POCP.

Methods: We conducted a cost-effectiveness analysis using the United States (US) health care system perspective. A hybrid model, consisting of a 1-year decision tree and a 20-year Markov model, was used to simulate a typical cohort of 65-year-old patients with acute coronary syndrome who underwent PCI was constructed. Treatment effects and adverse events were estimated from landmark clinical trials. The transition probabilities were extracted from the PLATO (Platelet Inhibition and Patient Outcomes) clinical trial. Treatment costs (2016 US. dollars) were estimated from the average cost of ACS treatment in the US as documented in published literature and drug costs were based on the manufacturer’s price based in US. Each simulated patient after PCI, received clopidogrel (CLopi) 75 mg once daily plus aspirin 81 mg daily or ticagrelor 90 mg twice daily (Ticag) plus aspirin 81 mg once daily. Patients were classified as follows, 1) POCP 2.) MTM + POCP 3.) MTM+ CLopi, 4.) MTM+ Ticag.

At the end of one year, patients were assigned to one of the 7 mutually exclusive health states, no event, non-fatal MI, stroke, bleeding, fatal bleeding, stent thrombosis, vascular death or all

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
caused death. A probabilistic sensitivity analysis was conducted to account for the joint uncertainty around the key parameters of our model. Because of the nature of the study, an Institution Review Board (IRB) approval was waived.

**Results:** The cost-effectiveness frontier analysis suggested that POCP was extendedly dominated and then eliminated from the trade-off analysis. The combination of MTM + Clp1 resulted in 5.25 QALYs (quality adjusted life-year), at a cost of $48653.29. MTM + POCP resulted in 5.29 QALYs, at a cost of $49127.88. MTM + Ticag resulted in 5.33 QALYs, at a cost of $51998.09. At a predefined $50,000 willingness to pay threshold, MTM+POCP was found to be the most cost-effective treatment option. The probabilistic sensitivity analyses confirmed the robustness of our base-case analysis.

**Conclusion:** Based on the results, at a threshold of $50,000 per QALY, the integration of MTM with POCP is a was cost-effective when compared to either POCP alone or MTM with universal clopidogrel or MTM with universal ticagrelor. One limitation is that, because of the scarcity of data, the transitional probabilities were based on the PLATO study. Therefore, a clinical trial will be needed to confirm our findings. In conclusion, in a transition of care services, an integration of MTM (which includes comprehensive medication review, medication reconciliation and patient education) and POCP is likely the most cost-effective strategy.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-039

Poster Title: Impact of pharmacist led intravenous to oral conversions at order entry for three high cost medications at a community hospital

Primary Author: Savannah Posey, University of Louisiana at Monroe; Email: posey@ulm.edu

Additional Author(s):
Jennifer Nickelson

Purpose: With the rising cost of drugs across the country, our hospital’s pharmacy department was tasked with providing tactics to decrease this cost burden while maintaining optimal patient care. A new cost saving initiative was proposed to move some of the intravenous (IV) to oral conversion interventions to point of order entry. With the implementation of physician computerized order entry, the pharmacy department has been striving to expand the role of the order entry pharmacist. Converting selected high cost IV drugs to lower cost oral therapies to order entry would improve the availability of clinical pharmacists’ time to be utilized for other clinical activities. Converting the IV medication to the oral formulation when the medication is first ordered would lead to increased cost savings by decreased the lag time of the conversion.

Methods: Starting in July 2015, the cost saving initiative was implemented at order entry, when one of the three medications, chlorothiazide, acetaminophen, and levothyroxine, were ordered. For chlorothiazide and levothyroxine, when an order was placed, the pharmacist processing the order would first verify if the patient was able to receive medications by mouth. If this was verified, an automatic switch to the oral formulation was completed. If this could not be verified, the pharmacist would then call the physician to discuss and request an IV to oral interchange of the medication if clinically appropriate. If the IV medication was continued, a clinical pharmacist would review it daily, Monday through Friday, to assess its appropriateness. An automatic IV to oral interchange was also approved by the hospital that could be performed by the clinical pharmacist team. When an order was received for IV acetaminophen the pharmacist processing the order was asked to verify compliance to the hospital’s IV acetaminophen restrictions. Before each dose was dispensed, the patient’s medication administration record was screened to determine if the patient was taking other oral medications and to verify that IV acetaminophen was not continued longer than twenty-four
hours. If other oral medications were being tolerated, an automatic IV to oral switch was made at order entry.

**Results:** In a 12 month period, it was verified that changing IV chlorothiazide to oral chlorothiazide at order entry saved approximately $25,000. For the same time frame, changing IV levothyroxine to oral levothyroxine saved approximately $10,000. Acetaminophen was reviewed for six months prior to implementation and a cost savings of approximately $8,400 was reached by changing the IV medication to the oral formulation and enforcing the twenty-four-hour duration restriction.

**Conclusion:** This initiative resulted in a reduction in drug cost. July 2015 through July 2016, the hospital saved a total of approximately $43,400 in a 12 month period by moving the IV to PO conversion of chlorothiazide, levothyroxine and acetaminophen to order entry. Other benefits include decreased unnecessary IV medication use, the expanded role of staff order entry pharmacists, and improved availability of clinical pharmacists.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-040

Poster Title: Development of a multi-medication management service in a health-system based specialty pharmacy

Primary Author: Veranika Sasnovskaya, University of Illinois at Chicago; Email: vsasno2@uic.edu

Additional Author(s):
Lisa Kumor

Purpose: Medication therapy management services have been shown to improve clinical outcomes in patients with numerous chronic conditions but this model is not commonly implemented in specialty disease states. The specialty pharmacy model solely focuses on specialty medication dispensing and education which leads the patient to multi-pharmacy use for their nonspecialty medications and segmentation of care. This project was designed to establish a new multi-medication management service for specialty patients at University of Illinois Hospital and Health Sciences System Specialty Pharmacy Services (UI-SPS).

Methods: UI-SPS piloted a new service for its patients starting January 1st, 2016. This service was offered to patients with chronic inflammatory conditions such as gastrointestinal diseases and rheumatoid arthritis, who have been receiving their specialty medication from UI-SPS. Patients were identified via routine care through monthly telephone adherence surveys for their specialty medication. Patients who were currently using disease-modifying antirheumatic drugs (DMARDs) were presented with an opportunity to receive those DMARDs prescriptions along with their specialty medication. The DMARDs included in this program were methotrexate, hydroxychloroquine, sulfasalazine, azathioprine, mesalamine, and leflunomide.

Results: After implementation of the new service, UI-SPS filled 240 DMARD prescriptions for 22 patients accounting for a growth in DMARD capture rate of 34 percent between January 1st, 2016 through December 31st, 2016. The total prescription revenue approximated $11,000. No full time equivalent was added and this program was incorporated in UI-SPS call center workflow. Health system clinicians and patients expressed satisfaction with the offered service. UI-SPS continues to provide the multi-medication management service to its patients with chronic inflammatory conditions with plans to expand to other health conditions for comprehensive disease state management.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Conclusion:** This program was created to bridge the gap in care in the current specialty pharmacy model. UI-SPS will continue to provide this service and investigate new opportunities to diminish multi-pharmacy use to improve continuity of patient care.
Submission Category: Clinical Services Management

Session-Board Number: 4-041

Poster Title: Implementation of a pharmacist managed glycemia protocol and transition of care service in post-operative cardiac surgery patients

Primary Author: Stacy Schoepke, Aspirus Wausau Hospital; Email: stacy.schoepke@aspirus.org

Additional Author(s):
Patricia Christopherson
Caitlin Lemmer
Jade Uffenbeck

Purpose: In 2016, the endocrinology department announced they would no longer provide inpatient glycemia management services due to provider shortage. This announcement had a major impact on heart surgery patients as endocrinology routinely provided post-operative hyperglycemia management. Hospital leadership and heart surgery providers requested assistance from pharmacy because pharmacists have provided inpatient glycemia management, upon request, since 2008. Before endocrinology announced the change, pharmacists provided glycemia management to 42 percent of all patients receiving insulin. This new service was designed to manage hyperglycemia for heart surgery patients post-operatively, determine insulin requirements for discharge, provide patient education, and order discharge prescriptions.

Methods: After obtaining administrative support, a committee was formed with representation from pharmacy, heart surgery providers, and diabetic educators. The current pharmacy glycemic protocol was reviewed and needs specific to heart surgery patients were identified. Pharmacist education was provided regarding the discharge process and electronic prescribing. The existing inpatient hyperglycemic insulin protocol was utilized and pharmacists worked closely with the diabetes educator to ensure the patient had sufficient and appropriate diabetic supplies and medication upon discharge to home. Patients were scheduled for follow up with an endocrinology provider after discharge and instructed to use on-call endocrinology services for any questions. The new service was fully implemented in August 2016. Data retrieval was accomplished by updating existing Clarity-(R) reports used for routine quality monitoring and limiting data extracted to those patients with heart surgeons as the admitting provider. Comparisons were performed using data from October 1, 2015 to March 31, 2016 for the endocrinology managed group and October 1, 2016 to March 31, 2017 for the pharmacist
managed group. Primary outcomes measured were percentage of blood glucose values in goal range (140-180 mg/dL), mean blood glucose, and percentage of blood glucose values less than 50 mg/dL or greater than 180 mg/dL. Also measured were the percentage of patients with at least one blood glucose result less than 50 mg/dL and number of extreme blood glucose values documented.

**Results:** Blood glucose data for the two groups was reviewed. Eighty-three patients were in the endocrine managed group (EM) and eighty-two patients were in the pharmacy managed group (PM). The percentage of blood glucose values in range was similar between groups with 60 percent in the endocrine group and 61 percent in the pharmacy group. The average blood glucose was 175 mg/dL in the EM group versus 173 mg/dL in the PM group. The percentage of patients with blood glucose values less than 50 mg/dL was three times higher in the EM group compared to those managed in the PM group. The incidence of hyperglycemia, defined as blood glucose greater than 180 mg/dL, was identical between groups at 39 percent. The number of extreme values, defined as a blood glucose value less than 25 mg/dL or greater than 570 mg/dL, was five times higher in the EM group. Pharmacists spent an average of 67 minutes per patient per hospital stay to provide this service.

**Conclusion:** A pharmacist managed glycemia protocol for post-operative heart surgery patients resulted in similar blood glucose values with fewer extreme glucose levels in comparison to services provided by endocrinology. Future directions for this service include exploring the implementation of a collaborative practice agreement with the heart surgeons, endocrinology, and other outpatient providers to improve upon the discharge process and transition of patient care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-042

Poster Title: Implementation of a discharge medication counseling service in a community hospital

Primary Author: Loretta Slone, King’s Daughters Medical Center; Email: loribelle.slone@kdmc.kdhs.us

Additional Author(s): Brittany Riley

Purpose: Discharge medication counseling is one area where pharmacists can assist in improving transitions of care. Often, the primary concern with program implementation lies in the practicality of a pharmacist providing this service. This project was designed to assess the feasibility of pharmacist providing a discharge medication counseling service.

Methods: Through the medication reconciliation committee, two pilot units were identified to trial this process, the Heart and Vascular Step Down unit and the Oncology Unit. Patients were identified for discharge during morning multidisciplinary rounds, with the goal to complete discharge counseling on two patients per day (Monday through Friday). Once the patient was identified for discharge by the team, the provider would complete discharge medication reconciliation and input the After Visit Summary (AVS). This summary is generated electronically and provided to the patient upon discharge. It includes a list of medications to start, stop, and continue, as well as instructions for future appointments and other important reminders. After completion of the AVS, the provider would notify the pharmacist that it was ready for review. The pharmacist would review the AVS for potential medication-related issues and provide discharge counseling once the AVS was finalized. A discharge counseling progress note was written in the electronic record detailing the session to provide the discharge nurse navigator items for follow-up/reinforcement post-discharge during the follow-up phone interview. The number of AVS recommendations and the time spent preparing and counseling were tracked utilizing a paper form. An open-ended comments section was also included for pharmacists to provide any additional information regarding the counseling session.

Results: The pilot lasted a total of 163 working days, during which a total of 659 patients were counseled on the pilot units. On average pharmacy counseled 4 patients per day. Pharmacists spent a total of 30.4 hours preparing for counseling, with an average of 49 minutes per day.
They spent a total of 18 hours counseling the patient, with an average of 29 minutes per day. On average the pharmacist made 2 recommendations per patient after review of the AVS. The types of recommendations included but were not limited to length of therapy for antibiotics, warfarin dose adjustments, and social work consults due to affordability of medications. 239 patients had questions for the pharmacists. Barriers to completing discharge counseling included lack of timely notification, discrepancies in the admission medication reconciliation and lack of staffing.

**Conclusion:** This project demonstrated that pharmacist provided discharge medication counseling is feasible. Further studies are needed to determine the impact of such a service.
Submission Category: Clinical Services Management

Session-Board Number: 4-043

Poster Title: Reducing financial toxicity for patients living with cancer through a collaborative pharmacy concierge program

Primary Author: Onisis Stefas, Northwell Health; Email: ostefas@northwell.edu

Additional Author(s):
Edward German
Chung-Shien Lee
Ashley Galla

Purpose: The total annual cost of cancer care in the United States is projected to reach 175 billion by 2020, an increase of 40 percent from 2010. This is largely attributed to the high cost of medication, which has more than doubled over the last decade and has led to higher out-of-pocket expenses for patients, exceeding 700 dollars per month. Unfortunately, it has been estimated that one-quarter of cancer patients in the U.S. delay treatment because of the cost. The purpose of this project was to determine whether a pharmacy concierge program improves access to high-cost oral chemotherapeutic agents.

Methods: Northwell Health’s Monter Cancer Center and Vivo Health Pharmacy collaborated to develop a Concierge Service for patients receiving oral chemotherapeutic agents located inside the outpatient treatment facility. Services include financial counseling, prior authorization and financial assistance, prescription delivery, and periodic clinical assessments by specialty-trained pharmacists. Two in-house Concierge Coordinators are readily available to meet with patients to arrange and provide these services. Coordinators are familiar with the requirements and approval processes related to pharmacy benefits. Medications are prescribed electronically by providers to the on-site Vivo Health Pharmacy or the patient’s preferred pharmacy. Each case is then reviewed by a coordinator for prior authorization necessity and patient eligibility for financial assistance. Uninsured patients are provided with medication at low or no cost. Whenever possible, prescriptions are delivered to patients in the waiting area or treatment room. For any patients who are unable to obtain their prescription at the time of visit, medications are delivered overnight to their home. All patients are contacted by the pharmacist to reinforce education, emphasize the importance of adherence and address medication-related questions. Reassessments are completed with each refill, with changes in therapy, or as
needed. All encounters with the pharmacist are documented within the electronic medical record to facilitate communication with providers across the continuum of care.

**Results:** The national benchmark for median time elapsed between when a new oral antineoplastic is prescribed and when it is received by the patient is 8 days. Prior to establishing the Concierge Service, the turnaround time on a prior authorization was approximately 4 days. To date, approximately 78 percent of all approvals are rendered same day and 98 percent within 48 hours, which allows patients to begin treatment sooner. In 2016, 1652 lives were touched, 255 patients were provided financial assistance, and 1.73 million dollars in out-of-pocket expenses were saved for patients enrolled in the program. In addition, Vivo Health Pharmacy beat the 2016 budget by over 4 million dollars in net income through the highly effective and efficient model. Patient and staff satisfaction with the program has been overwhelmingly positive. On a scale of 1 to 4, with 4 being the highest score possible, 100 percent of staff surveyed rated the service a 4 on overall satisfaction, pharmacist’s knowledge, ease of contact, courtesy and helpfulness, and resolution of concerns.

**Conclusion:** As specialty pharmacy and the oncology pipeline continue to grow at unprecedented rates, pharmacies should work collaboratively with other members of the interdisciplinary health care team to employ innovative strategies targeting cost, quality, and access. Patient-centered pharmacy concierge programs improve access to high-cost oral chemotherapeutic agents, reduce financial toxicity to patients, enhance the patient experience and support fiscal health of the institution.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-044

Poster Title: Proton pump inhibitor stewardship in 93 long term acute care hospitals

Primary Author: Kurt Streepy, Select Medical; Email: kstreepy@selectmedical.com

Additional Author(s):
Chris Marshall
Antony Grigonis
Samuel Hammerman

Purpose: A proton pump inhibitor (PPI) stewardship program was implemented in a system of long term acute care hospitals (LTACHs) in 2016. Since 2010, in the LTACH system, pharmacy interventions have focused on reducing unnecessary use of PPIs in chronically critically ill patients commonly treated in LTACHs. Due to longer lengths of stay and unique clinical complexities of chronically critically ill patients, clinical leadership recognized an opportunity to improve PPI utilization by implementing a renewed rollout of interventions that included a PPI utilization protocol and a metric system to track PPI utilization.

Methods: In 2010, the LTACH system-wide pharmacy clinical leadership team developed an advisory statement to alert practitioners about FDA findings related to an increased risk of C. difficile and pneumonia in patients receiving PPIs. At that time, there was a recommendation to limit prophylactic use to high risk patients. This advisory statement was adopted by the LTACH system physician advisory board and was updated in 2012 with additional supportive literature. In 2016, the pharmacy team again updated the statement with relevant literature and also advised member hospitals to develop a therapeutic interchange from PPIs to histamine-2 inhibitors, or discontinue therapy completely, in patients without a clear indication for PPIs. A protocol was developed and provided to each hospital’s pharmacy team to support pharmacy intervention in PPI therapy. The protocol included recommended times to review PPIs, admission medication reconciliation, rounds, and weekly medication regimen review. To help evaluate their progress, hospitals were provided with their PPI utilization data. Utilization was calculated by the number of days patients received a PPI over the total number of days in the hospital. Baseline data was initially provided for review during pharmacy and therapeutic committee meetings. Ongoing quarterly data was then provided to each hospital to assist with assessing the impact of the PPI stewardship program.
Results: System-wide PPI utilization data was examined before and after implementation of the pharmacy PPI protocol. Applying a generalized linear mixed model, quarterly PPI utilization data from 93 LTACHs that were operational in both periods (pre- and post- PPI utilization intervention) showed a significant reduction in PPI utilization, from an overall average of 54.4% at baseline (third quarter 2015 to first quarter 2016) to 41.8% during the post-intervention period (third quarter 2016 to first quarter 2017) \(F(1,340)=80.81, p < .001\). The 23.2% reduction in PPI utilization eliminated an estimated 86,483 PPI doses based on the total number of patient days in the post-intervention period. Case mix index did not have a significant effect on PPI utilization between pre- and post- intervention. Infection quality metrics, patient satisfaction, and risk measures were not significantly associated with the reduction of PPI utilization following PPI protocol implementation.

Conclusion: A PPI utilization stewardship program was successful in reducing PPI utilization for patients treated in LTACHs; reduction in PPI utilization was not associated with patient acuity. The use of hospital-specific utilization data allowed each pharmacy team to compare their PPI utilization to other hospitals and track their progress. The support of both system and local leadership for the PPI protocol was essential to the success of this pharmacy stewardship program.
Submission Category: Clinical Services Management

Session-Board Number: 4-045

Poster Title: Impact of a clinical pharmacist on a transfusion-free medicine and surgery service

Primary Author: Eridania Teixeira, Rhode Island Hospital; Email: eri757@yahoo.com

Additional Author(s):
Kevin Wright
Safiya Naidjate
Rachel Fortin
Christine Berard-Collins

Purpose: An increasing number of hospitals are implementing transfusion-free services as a result of patients’ personal and medical concerns regarding blood transfusions. The Transfusion-Free Medicine and Surgery (TFMS) service at our hospital offers a safe alternative to blood transfusions by utilizing innovative techniques that minimize blood loss and can avert the need for blood products. Appropriate use of pharmaceutical agents is essential to optimizing hematopoiesis and maintaining hemodynamic stability. The purpose of this pilot was to assess patient clinical outcomes as well as interventions made by a pharmacist by providing evidence-based dosing recommendation of pharmaceutical agents during hospitalization and post-discharge.

The TFMS service consists of highly-trained medical professionals to accommodate the healthcare needs of individuals who opt out of receiving blood or blood products. A pharmacist was consulted to join the existing TFMS service. Patients were enrolled in TFMS services by means of inpatient clinician consults. Clinical activities of the pharmacist included: presenting at the patient’s bedside with the TFMS team, reviewing patient’s medications, identifying discrepancies and drug interactions, recommending discontinuation of antithrombotic agents, identifying the need for laboratory testing, and discussing the case with the overseeing clinician. Institution-approved protocols and primary literature were used to provide evidence based dosing recommendation to ensure safe and effective use of pharmaceutical agents. These agents included recombinant human erythropoietin, intravenous iron, vitamin B12 and folic acid. Clinical outcomes of interest included absolute changes in hemoglobin and hematocrit. Interventions made by the pharmacist were maintained and classified as low, moderate, high or critical risk using the institution’s scale based on potential harm caused to patient.
This is a report on one patient receiving TFMS services with the assistance of a pharmacist. The patient was hospitalized for a total of 6 days and the pharmacist was first consulted on hospital day 3. On the first day of hospitalization, the hemoglobin was 6.2 g/dL and hematocrit was 19.0%. Nadir hemoglobin and hematocrit were observed on hospital day 4 with levels of 5.1 g/dL and 16.3%, respectively. At discharge, hemoglobin was 5.9 g/dL & hematocrit 18.9% and patient was in stable condition. Following discharge, the patient received oral supplementation of iron, folic acid, vitamin B12 indefinitely. Complete blood count was monitored periodically. Within one month post discharge, hemoglobin was 7.1 g/dL and hematocrit was 24.3%. The patient was reported to be in stable condition and in usual state of health. There were a total of 6 pharmacist interventions made: 3 dosing recommendations for human erythropoietin, intravenous and oral iron; 1 inappropriate dosing schedule of intravenous iron, 1 therapeutic omission of vitamin B12 and folic acid, and 1 de-escalation of therapy for erythropoietin post discharge plan. A total of 1 intervention was considered high risk, 2 were moderate risk and 3 were low risk.

This case suggests that opportunities exist for pharmacists to assist in transfusion-free services by providing evidence based dosing recommendations of pharmaceutical agents, thereby ensuring safe use and improved outcomes when managing anemia without the use of blood or blood products.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Services Management

Session-Board Number: 4-046

Poster Title: Implementation of clinical pharmacists in care coordination on surgical units in a tertiary academic center: a review

Primary Author: Jackie Tran, Johns Hopkins Medicine; Email: jtran16@jhmi.edu

Additional Author (s):
Ahmed Eid
John Hill
Jennifer Gillespie
Virna Almuete

Purpose: Surgery pharmacy is a topic not routinely covered in pharmacy school and literature regarding the role of pharmacists in this field is ill-defined. The involvement of a clinical pharmacist rounding with the treatment team can usually be seen in medicine services, specialties (transplant, oncology or infectious disease) or in the intensive care unit. The purpose of this project is to review the impact of having a clinical pharmacist working on surgical floors and determine the pharmacy services that could be provided for this patient population.

Methods: In June 2016, our hospital went live with a new electronic health record (EHR) which changed the documentation processes for patient monitoring and pharmacist interventions. Using the new EHR's reporting system, reports were run over a period of 6 months to collect information focusing on the pharmacist's involvement with antimicrobial stewardship, warfarin monitoring and patient education. Similar reports were run on several of our medicine services which have an established pharmacist presence to serve as a comparator. The reports were compared to look at the differences and similarities in the pharmacist intervention between the disciplines. Clinical pharmacists were also asked to share the other responsibilities they provide for their clinical service to identify potential areas of expansion.

Results: Between the two surgery clinical pharmacists, there were a total of 878 patients reviewed for antimicrobial stewardship, 105 patients monitored for warfarin and 117 instances of patient education were completed. Services provided by the traditional medicine clinical pharmacists that would be of interest to integrate into current surgery pharmacist responsibilities include complete medication reconciliation within 24 hours of hospital admission, discharge summary review, and patient requested counseling.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Limitations to this review include differences in documentation practices between the different pharmacists. The data captured in the reports may underestimate the true number of interventions provided by the pharmacists. Limitations to the expansion of these services include available staffing and maintaining appropriate patient-pharmacist ratio. Current staffing situation has 1 pharmacist to clinically cover upwards to 64 patients. Adding on more responsibilities puts staff at high risk for burn out and decreasing the quality of work to complete new services. Adding another pharmacist per unit would improve the patient-pharmacist ratio which would allow for more time to be dedicated towards these initiatives.

**Conclusion:** The optimal role of a clinical pharmacist in the general surgical population is still to be defined however we have identified great areas of success in antimicrobial stewardship, wafarin monitoring and patient education. Potential areas of expansion include further expansion of patient education efforts to all medications, thorough medication reconciliation and discharge counseling for all patients prior to discharge from the hospital. Expansion of these services would involve recruitment of at least two more pharmacists however improvements in HCAHPS scores, patient safety and patient care can justify the need for the additional staff.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Critical Care

Session-Board Number: 4-048

Poster Title: Fentanyl monotherapy versus the fentanyl plus midazolam combination in the management of mechanically ventilated neonates in the intensive care setting in Qatar: a cost-effectiveness analysis

Primary Author: Daoud Al-Badriyeh, College of Pharmacy Qatar University; Email: daoud.a@qu.edu.qa

Additional Author(s):
Dina AbuShanab
Omar Alsoukhni
Fouad Abounahia

Purpose: Neonates with respiratory distress syndrome (RDS) in the neonatal intensive care unit (NICU) at the Women’s Hospital (WH) in Qatar, as in many overseas practices, often require fentanyl or fentanyl based analgesia using midazolam to facilitate the invasive procedure of mechanical ventilation (MV) and improve ventilator-patient synchrony. The objective of this study was to evaluate the clinical and economic impact of fentanyl monotherapy versus fentanyl plus midazolam combination in critically ill neonates undergoing MV due to RDS.

Methods: A comparative retrospective cost-effectiveness study was conducted to evaluate critically ill neonates receiving fentanyl versus the fentanyl plus midazolam combination at WH in Qatar. Study neonates were identified through the Cerner electronic medical records database at NICU between October 2014 and January 2016. Decision analytic model from the hospital perspective was designed to measure all the possible consequences of fentanyl alone and the fentanyl plus midazolam. The sedation success consequences included success with adverse drug reactions (ADRs) and success with no ADRs. Sedation failure was defined as the need for increased dose, the switch to alternatives, withdrawal symptoms, death, and the persistent agitation. The primary clinical endpoint was the successful drug sedation rate, based on the Premature Infant Pain Profile (PIPP) scoring scale. Also a primary outcome was the overall direct medical cost of therapy, which included costs of sedative medications, therapies to manage ADRs associated with sedatives, MV, length of NICU stay, and the diagnostic, laboratory and monitoring tests during the NICU stay. To achieve results with 80% power and a significance level of 0.05, a total sample size of 268 was calculated. Chi-square and Fisher’s exact tests were used to test for similarity between the study groups. One-way and multivariate
sensitivity analyses by the Monte Carlo simulation were conducted, via @Risk 7.5, to enhance the robustness and generalizability of the study conclusions.

**Results:** Fentanyl monotherapy achieved sedation success in 51% of patients with an economic advantage of QAR 43,812 per patient compared to 33% with fentanyl plus midazolam. Success with ADRs and the failure due to switching to alternatives were the most two contributing outcomes in the total cost of both fentanyl and fentanyl plus midazolam. A probability of these outcomes that is higher with the fentanyl combination, added to a longer duration in the combination therapy, which allows for more utilization of MV that leads to the longer stay at the NICU, justifies the overall cost saving associated with the fentanyl monotherapy. Based on Monte Carlo simulation, fentanyl alone had a 100% probability of having an economic advantage over the combination regimen. The model was insensitive to the changes in all the variables in both groups, maintaining a favorable outcome with the fentanyl monotherapy. Also, the uncertainty analyses demonstrated that sedation success model pathway with the fentanyl plus midazolam therapy had the highest influence on the study outcome, followed by the sedation success pathway with the monotherapy.

**Conclusion:** This is the first cost-effectiveness evaluation of fentanyl monotherapy versus fentanyl plus midazolam combination in NICU in literature, including Qatar. Fentanyl monotherapy was associated with higher clinical effectiveness and lower cost. This contradicts current practices in Qatar, where midazolam is added to sedatives with the anticipation of enhanced effectiveness.
Submission Category: Critical Care

Session-Board Number: 4-049

Poster Title: Making the shift from “sedation” to managing pain: implementing the 2013 SCCM Pain, Agitation & Delirium (PAD) guidelines reliably in an open community-based ICU

Primary Author: Liza Andrews, Rutgers/RWJBarnabas Health, Hamilton; Email: lbarbarello@pharmacy.rutgers.edu

Additional Author(s):
Natalie Jones
Nina Roberts
Suzanne Caravella

Purpose: Establishment of a new critical care clinical pharmacy program in 2016 in an open model, mixed medical/cardiac/surgical ICU of a community hospital identified routine antiquated benzodiazepine-based strategies, predominately as infusions, for provision of sedation during mechanical ventilation without reliable provision of analgesia-first strategies as recommended by current guidelines. A pharmacist-led interprofessional quality initiative was undertaken to establish Society of Critical Care Medicine (SCCM) Pain, Agitation & Delirium (PAD) guideline-compliant practices. This evaluation describes the development, training, implementation and compliance with the resulting order sets as well as trends in drug utilization and ventilator statistics during the first month of use.

Methods: Mandatory order sets for initial PAD management promoting analgesia-first strategies were developed and approved through an interprofessional process. Order sets were designed to consider baseline opioid and/or benzodiazepine dependence status to avoid agitation secondary to withdrawal and guided prescribers toward analgesia-first, fentanyl-based strategies in drug sparing administration methods. Once initiated, evaluation for individualization of empiric dosing was designed to occur within the initial three hours or at any time thereafter when increased drug utilization was noted; optimization and escalation of default doses were encouraged over infusion initiation. Over 3 months prior to implementation, significant interprofessional education (including hospitalists, private, critical care and emergency prescribers; pharmacists, nurses, and respiratory therapists) was provided to assure current guideline and drug knowledge, as well as of the rationale and assumptions supporting the strategies reflected in the order sets. Beyond drug choice and application, optimization of assessment scales was implemented. The use of RASS, implemented the year

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
prior, was reinforced and transition from non-preferred scales (such as FLACC) to preferred pain scales (CPOT) was educated and implemented. Order set implementation was supported by prospective evaluation by the clinical pharmacist and nurse educator. Data regarding drug choice and administration method were evaluated the first month of the protocol’s implementation to the same month the prior year. Additionally, time to initiation of ventilator wean, ventilator days and self-extubation rates were compared similarly.

Results: Through reinforcement by reviewing pharmacists, 100 percent compliance with the required order set in the first month of utilization was achieved. In comparing the first month of implementation to the same month in 2015, use of infusion strategies decreased while the use of intermittent strategies predominated. Benzodiazepine and propofol infusion utilization decreased (1 lorazepam, 1 midazolam, 6 propofol in 2016 compared to 4, 9, and 19, respectively, in 2015) consistent with the analgesia-first strategies supported by the order set as well as the secondary role of infusions to intermittent strategies. Fentanyl infusion utilization doubled (12, 2016 vs. 6, 2015) as analgesia-based strategies were applied over traditional sedative-based regimens. Correlating positively with decreased drug exposure associated with intermittent strategies compared to infusion strategies and reinforcement and standardization of lighter sedation goals (RASS 0 to -2 and CPOT less than 3), average time to initiating ventilator wean decreased from 1.75 to 1.1 days and average ventilator length of stay decreased from 4 to 3 days. Self-extubation rates, as a surrogate marker for safety of lighter sedation targets achieved predominantly through intermittent strategies, remained the same as the year prior.

Conclusion: The use of a mandatory order set coupled with widely available support and education resulted in rapid evolution of sedation practices. In the first month there were significantly less benzodiazepine and propofol and significantly more opioid utilization consistent with the tenants of the 2013 SCCM PAD guidelines. This corresponded to a reduction in ventilator days with no increase in self-extubation. Reliable transformation of sedation practices to evidence based strategies in an open model ICU was achievable through implementation of a required order set fostering an analgesia-first, benzodiazepine-sparing approach that considers baseline dependence for mechanically ventilated patients.
Submission Category: Critical Care

Session-Board Number: 4-050

Poster Title: Influencing factors to vancomycin clearance in trauma intensive care unit patients

Primary Author: Hundo Cho, Ajou University Hospital; Email: hundocho@gmail.com

Additional Author (s):
Young Hwa Choi
Suna Lee

Purpose: Appropriate vancomycin dosing is needed to treat patients with multiple trauma in intensive care unit (ICU). The trough level of vancomycin in trauma intensive care unit (TICU) patients was lower than other ICU patients at Ajou University Hospital, 1,084 beds of tertiary hospital. A lower vancomycin concentration may be associated with treatment failure of trauma ICU (TICU) patients. We evaluated the factors affecting vancomycin levels and studied pharmacokinetics of vancomycin in TICU patients compared to medical ICU (MICU) patients to guide appropriate dosing of vancomycin.

Methods: We retrieved the therapeutic drug monitoring (TDM) database at the pharmacy in Ajou University Hospital retrospectively to select appropriate cases. Between January 2015 and December 2015, patients who admitted to the TICU or MICU were selected. All patients received at least 3 doses of vancomycin intravenously and serum vancomycin levels were expected to steady state. After the expected steady status, the serum vancomycin through level and TDM were checked. Patients under 19 years old, end stage renal disorder with intermittent hemodialysis or continuous ambulatory peritoneal dialysis and pregnant woman were excluded. Fifty six patients/76 cases of TICU and 89 patients/96 cases of MICU were analyzed. We reviewed patient medical history, laboratory results, use of vancomycin and other drugs, clinical findings and pharmacokinetics of vancomycin. Continuous variables are expressed as means plus minus (±) standard deviation, and categorical variables as frequencies and percentages. Group comparisons were analyzed independently by Student’s t-test for continuous variables and the chi-square test for categorical variables. For evaluation of correlation of variables, Pearson test was done, and interrelationship effects of each variable were analyzed by multiple linear regression tests. A two-tailed p-value of < .05 denoted the presence of a statistically significant difference.
**Results:** Many characteristics of patients were significantly different between TICU and MICU, especially body weight (71.93±14.78, 58.36±19.88; kg; P < .0001) and weight associated factors including overweight, overweight percentage, body mass index (BMI), body surface area (BSA) and creatinine clearance (143.52±69.41, 97.24±63.69;mg/dl; P < .0001). In non-continuous renal replacement therapy (CRRT) group the pharmacokinetics of vancomycin had much difference between two ICU, and clearance of vancomycin was higher in TICU patients (74.25±27.99, 53.74±23.91; ml/min; P < .0001), but in CRRT group there was no significant difference of clearance of vancomycin (35.42±11.03, 30.96±9.64; ml/min; P = .215). In non-CRRT group the only factor associated with vancomycin clearance was creatinine clearance (coefficients 0.156, P = .017), and in CRRT group there was no influencing factor.

**Conclusion:** Multiple trauma patients in intensive care unit were heavier than other ICU patients because of intensive fluid therapy. Regardless of other factors, vancomycin can be used as a fixed dose for patients on CRRT. However, in patients with multiple trauma, a more appropriate dose of vancomycin is required depending on the creatinine clearance and body weight, and therapeutic vancomycin levels should be monitored.
Submission Category: Critical Care

Session-Board Number: 4-051

Poster Title: Evaluation of the use of ethanol infusion for alcohol withdrawal

Primary Author: Ramy Girgis, Florida Hospital; Email: ramygirgis@gmail.com

Additional Author(s):
Patricia Louzon-Lynch

Purpose: Ethanol infusion is used to prevent alcohol withdrawal syndrome (AWS) in hospitalized alcohol-dependent patients. The current pharmacologic therapy at our institution is the Clinical Institute Withdrawal Assessment (CIWA) alcohol withdrawal order set which utilizes the CIWA score and administration of lorazepam. Advocates of intravenous ethanol propose that it provides effective AWS prophylaxis without the excessive sedation of benzodiazepines. The purpose of this MUE is to evaluate the use of ethanol infusion for alcohol withdrawal through use of a pilot order set. This medication use evaluation examines the efficacy and safety of this practice.

Methods: The research design is a retrospective chart review of patients who received IV ethanol from May 2014 to May 2015 at Florida Hospital Orlando. The order set included dosing of 0.5mL/kg/hr, daily ethanol levels, CIWA score every four hours, RASS every one hour for 24 hours, then every two hours. Inclusion criteria was if the patient had received the ethanol drip. The standard indication for the IV ethanol as per our order set were patients at risk for alcohol withdrawal based on history of alcohol consumption or CIWA score >10, exhibiting symptoms of alcohol withdrawal (anxiety, tremors, tachycardia, diaphoresis, hallucinations, tachypnea, pyrexia, hypertension) with secondary causes excluded. Exclusion criteria was all patients less than 18 years of age or drip not administered. Chart review was done on all patients evaluating inclusion and exclusion, admission diagnosis, ability to give oral medications, surgical and medical history and prescriber. Our primary outcomes were CIWA score and Confusion Assessment method for the ICU (CAM-ICU) score. Secondary outcomes were adverse events, compliance with order set, ethanol levels, Richmond Agitation Sedation Scale (RASS) scores, liver function tests, oral alcohol, CIWA alcohol withdrawal power plan, prescriber, concomitant medications, drip duration, length of stay and intubation. Additionally, baseline demographics were collected on these patients including toxicology screen, surgical history, history of alcohol withdrawal and seizures.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** Ethanol was ordered in 67 patients. Five patients were excluded as ethanol was not administered. Two patients (3%) had a history of seizures, and two patients (3%) had history of alcohol withdrawal syndrome. Patients with no documentation of alcohol consumption at home were 47 (76%). Only 20 patients (32%) had a CIWA score documented, with a mean CIWA of 6.2. The order set recommended dose was only given in 11 patients (18%). Only 17 patients (27%) were above the minimum therapeutic dose identified in literature. Over sedation, defined as RASS of -3 or lower, was noted in 12 patients (19%) who were ordered IV ethanol, which was higher in those not utilizing the order set (two patients using the order set and ten patients who were ordered ethanol without the order set.) Only one patient had a daily ethanol level drawn. The order set was not utilized in 40 patients (65%), likely contributing to the low compliance with monitoring parameters. Significant LFT changes were noted in 4 patients (6%). The majority of the patient population was cardiovascular surgery patients at 61 doses (80%) out of 76 total doses. Remaining doses were ordered by critical care, cardiology and hospitalists.

**Conclusion:** Based on low order set compliance, efficacy and safety profile of IV ethanol utilizing the order set cannot be full established by this medication utilization review. Further studies are needed with higher order set compliance. Trends of potential under-dosing, oversedation and under-utilization of CIWA scoring were identified. We will continue to encourage the use of the CIWA order set as the standard of therapy for alcohol withdrawal and recommend mandatory order set use to ensure compliance with all components.
Submission Category: Critical Care

Session-Board Number: 4-052

Poster Title: Evaluation of a pharmacy-derived extravasation management policy at a community health care system

Primary Author: Daniel Padgett, Baptist Healthcare; Email: dpadg55@gmail.com

Additional Author(s):
Shelby Gaudet
Rudy Seelmann

Purpose: In January 2015, phentolamine production ceased, prompting Baptist Health Care to determine alternative agents for extravasation management. The pharmacy department developed an all-inclusive policy and accompanying kit, which utilizes topical nitroglycerin ointment and subcutaneous terbutaline in place of phentolamine. The primary purpose of this study was to assess appropriate utilization of the pharmacy-derived extravasation management policy. Secondary endpoints include effectiveness of phentolamine alternatives, as well as the association of catheter gauge and placement to the incidence of extravasation.

Methods: The Baptist Health Care pharmacy-derived extravasation management policy was implemented in February 2015. A query from the electronic adverse event reporting system from March 2015 to February 2017 resulted in 133 extravasation events. Further patient data from each event were retrospectively extracted from electronic health record chart reviews. These variables include age, gender, unit location, catheter size, insertion site, medication and volume of extravasation, infusion rate, symptoms, photographs and medical management. Data was imported and analyzed in a spreadsheet utilizing pivot tables. Eleven patients were excluded due to lack of documentation or availability of information. Therefore, a total of 122 incidences of extravasation were analyzed in this two-year study.

Results: Appropriate extravasation management per policy includes elevation of affected site, appropriate compress applied and antidote given if indicated. Extravasation events post policy implementation were compliant with the policy 66% of the time. Therapy was non-compliant 6% of the time, whereas policy compliance was indeterminable in 28% of events due to lack of documentation. Of the 122 reported extravasation events, there were 30 cases which did not indicate the causative agent. Of the remaining 92 reported events, 70.7% (n=65) occurred with contrast media, 9.8% (n=9) with vasoactive agents, and 5.4% (n=5) with vancomycin. Of the
eight patients that received the phentolamine alternatives secondary to vasopressor extravasation, four were administered terbutaline monotherapy, one was given topical nitroglycerin monotherapy, while three were treated with concomitant terbutaline and topical nitroglycerin. One of the patients from the terbutaline monotherapy group experienced extensive blistering. The remaining seven patients had mild symptoms such as pain, erythema, and edema which resolved after following the pharmacy-driven extravasation management policy. Analysis of the study events revealed an association of extravasation with smaller catheter gauge and peripheral venous access. Specifically, extravasations occurred in 92% of cases with catheters - 20 gauge and 98% of events occurred via peripheral venous access.

**Conclusion:** Implementation of a health care system wide policy has shown successful management of extravasation events. Although compliance rates are moderately high, improved documentation may have revealed more fortuitous results. Study analysis showed event risk may be reduced by utilizing 18 gauge peripheral catheters or central venous access when infusing vesicants. The effectiveness of terbutaline and topical nitroglycerin ointment in vasoactive extravasation has resulted in a clinical alternative to the remarked phentolamine and provided a cost savings opportunity of approximately $3,000 during the two-year study period.
**Submission Category:** Critical Care

**Session-Board Number:** 4-053

**Poster Title:** Use of an algorithm-based protocol to improve the safety and effectiveness of insulin infusions in adult critically ill patients

**Primary Author:** Andrew Straznitskas, NYC Health + Hospitals/Bellevue; **Email:** andrew.straznitskas@bellevue.nychhc.org

**Additional Author(s):**
Bella Kohn
Michael Blumenfeld

**Purpose:** Moderate glycemic control, defined as maintaining blood glucose below 180 mg/dL, has been associated with improved morbidity and mortality in adult critically ill patients. Guidelines recommend the use of insulin in critically ill patients when blood glucose exceeds 150 mg/dL. Certain patients will require insulin infusions and the use of a titration protocol that minimizes hypoglycemia is recommended. A nursing titrated, algorithm based insulin infusion protocol was implemented in an effort to improve glycemic control and minimize hypoglycemia at the study institution. The goal of this study was to evaluate the safety and effectiveness of the updated insulin titration protocol.

**Methods:** This retrospective, pre-post cohort study was conducted as a quality improvement project without the use of patient identifiers at a tertiary care, urban, academic medical center. Patients over 18 years of age who were treated with an insulin infusion in an intensive care unit during the three months prior to implementation of the protocol were compared to those treated during the three months following implementation. In the post-protocol cohort, patients who required an insulin infusion were managed using a nursing-titrated, algorithm based protocol titrated to achieve moderate glycemic control. Effectiveness was evaluated by comparing the percentage of blood glucose readings within goal throughout the entire duration of treatment with an insulin infusion. Effectiveness was further assessed by comparing the percentage of blood glucose readings maintained within goal after moderate glycemic control was achieved with an insulin infusion. Safety was evaluated by comparing the rate of any hypoglycemia, defined as blood glucose below 100 mg/dL, severe hypoglycemia, defined as blood glucose below 70 mg/dL, and symptomatic hypoglycemia or hypoglycemia requiring treatment.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: A total of 66 cases were included in the study, 25 in the pre-protocol cohort and 41 in the post-protocol cohort. The indication for use of an insulin infusion was hyperglycemia of critical illness in approximately 80% of patients in both cohorts; all other patients were treated with insulin infusions for diabetic ketoacidosis or hyperosmolar hyperglycemic state. The total percentage of blood glucose within the goal range while receiving an insulin infusion increased from 36% to 41% following implementation of the protocol (p = 0.03). Once the goal of moderate glycemic control was achieved following the initiation of an insulin infusion, blood glucose remained within the goal range for 46% of readings pre-protocol compared to 61% of readings post-protocol implementation (p < 0.01). Incidences of hypoglycemia significantly decreased following implementation of the insulin infusion protocol. In the pre-protocol cohort, 68% of patients experienced hypoglycemia below 100 mg/dL compared to 37% of patients in the post-protocol cohort (p = 0.02). Hypoglycemia below 70 mg/dL occurred in 24% of patients in the pre-protocol cohort compared to 5% in the post-protocol cohort (p < 0.05).

Conclusion: Implementation of a nursing titrated, algorithm based insulin infusion protocol resulted in mild improvement in glycemic control in the intensive care unit. Following protocol implementation, hypoglycemia decreased by 45% relative to pre-protocol rates. The incidence of severe hypoglycemia, below 70 mg/dL, decreased by 79% relative to pre-protocol rates. The improved safety profile of insulin infusions achieved following protocol implementation was not associated with a decline in glycemic control.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Critical Care

**Session-Board Number:** 4-054

**Poster Title:** Is levetiracetam associated with agitation in traumatic brain injury?

**Primary Author:** Victoria Tsai, Scripps Mercy Hospital; Email: tsai.victoria@scrippshealth.org

**Additional Author(s):** Harminder Sikand

**Purpose:** The Brain Trauma Foundation guidelines recommend using phenytoin during the first seven days after a traumatic brain injury (TBI) for early post traumatic seizure (PTS) prophylaxis. Phenytoin requires close therapeutic monitoring and has a high chance for potential side effects and medication interactions. Few small studies have suggested that levetiracetam may be a viable alternative to phenytoin with similar efficacy as phenytoin in preventing early PTS. While trauma guidelines from 2016 still do not recommend levetiracetam, current early PTS prophylaxis has already shifted from phenytoin to levetiracetam. Anecdotally, agitation has been seen in TBI patients receiving levetiracetam.

**Methods:** This is a retrospective observational study looking at all traumatic brain injury patients admitted to the trauma service at Scripps Mercy Hospital from 2010-2012 and from 2014-2016. The primary objective is to determine the incidence of agitation caused by levetiracetam in patients with traumatic brain injury. Patients were split into two groups, trauma intensive care unit (ICU) and trauma floor, depending on how severe a patient’s traumatic brain injury was. Patients’ who had greater than a 1 day stay in the ICU were placed in the trauma ICU group, all other patients were placed in the trauma floor group. Patients who were admitted to the trauma service for a TBI, at least 18 years of age, and received either levetiracetam, phenytoin or fosphenytoin for early PTS prophylaxis were included in the study. Patients who had no RASS score recorded, a hospital stay of less than 1 day, a history of psychiatric disorder, a positive drug screen or a detectable alcohol level upon admission were excluded from the study. Parameters evaluated include: age, injury severity scoring, abbreviated injury scale, Glasgow coma scale, Richmond Agitation Sedation Scale (RASS) scores, and duration and dose of levetiracetam, phenytoin or fosphenytoin. Patient’s agitation was assessed using RASS scores and nurse recorded assessment in conjunction with concurrent use of benzodiazepines (midazolam, lorazepam) and antipsychotics (haloperidol, quetiapine).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** A total of 4988 patients were reviewed during the study period. After the inclusion and exclusion criteria were applied there was 82 patients in the levetiracetam arm (ICU, 33 patients; Floor, 49 patients) and 19 patients in the phenytoin arm (ICU, 8 patients; Floor, 11 patients). There was no statistically significant difference seen in both the ICU and floor groups between patients who received levetiracetam versus phenytoin in regards to the amount of patients’ agitated (ICU, P equals 0.71; Floor, P equals 0.98) and the percent of patients’ who required a safe unit (ICU, P equals 0.22; Floor, P equals 1). There was also no statistically significant difference seen in both the ICU and floor groups between patients who received levetiracetam versus phenytoin in regards to the amount of haloperidol (ICU, P equals 0.99; Floor, P equals 0.30), quetiapine (ICU, P equals 1; Floor, P equals 0.56), benzodiazepines (ICU, P equals 0.12; Floor, P equals 1.00), opioids (ICU, P equals 1.00; Floor, P equals 0.40), and propofol (ICU, P equals 0.69; Floor, P equals 0.40) used.

**Conclusion:** There was no statistically significant difference seen in the amount of agitation documented or the amount of medications used to treat agitation in patients receiving levetiracetam versus phenytoin in both the trauma ICU or the trauma floor group for early PTS prophylaxis. However, this study showed that 22% of patients with a TBI were agitated while on levetiracetam.
Submission Category: Critical Care

Session-Board Number: 4-055

Poster Title: Drug repositioning research aimed at improving the survival rate of patients with cardiopulmonary arrest using large-scale medical claims database

Primary Author: Yoshito Zamami, Tokushima University Graduate School; Email: zamami@tokushima-u.ac.jp

Additional Author(s):
Takahiro Niimura
Masaki Imanishi
Kenshi Takechi
Keisuke Ishizawa

Purpose: Worldwide, every year approximately 100 million people develop cardiac arrest, making it an international issue. The proportion of patients who can return to normal life is extremely low. Since there is no drug treatment to improve survival rate of patients with cardiopulmonary arrest, the development of novel drug treatments is desirable. In recent years, drug repositioning has been proposed as a strategy for developing existing drugs as therapeutic agents for different diseases. In the present study, we conducted drug repositioning study using large-scale medical information with the aim of improving the survival rate of cardiopulmonary arrest patients.

Methods: First of all, candidate drugs expected to have a prognostic improvement effect on cardiopulmonary arrest pathology were extracted using TargetMine, a drug discovery tool integrating various databases related to drugs. Next, using cardiopulmonary arrest cases acquired from the Japan Medical Data Center, we examined whether or not candidate drugs are contained in drugs administered within 1 month after cardiopulmonary arrest diagnosis. In addition, binomial logistic regression analysis was performed with the presence or absence of administration of these candidate agents as an explanatory variable, and the discharging medical treatment which defined "survival to discharge", as a target variable. Furthermore, regarding drugs that were found to be significantly related to survival to discharge, adjusted odds ratios for survival to discharge were calculated by excluding the influence of covariates such as patient background, medical history, and treatment factors using propensity score. This study was conducted in keeping with the Ministry of Health, Labour, and Welfare’s Ethical Guidelines for Epidemiological Research. This study was reviewed and approved by the Ethics

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Committee of University Hospital (approval number: 991) and conformed to the tenets of the Declaration of Helsinki. Since this study was an observational study that did not involve treatment interventions and collection of human samples, obtaining of informed consent was exempted.

**Results:** 281 drugs and compounds with vasodilating and neuropathic inhibitory action were extracted by TargetMine. Among them, 78 kinds of injection preparations were extracted after excluding compounds, unapproved drugs in Japan, oral and external preparations. We also examined whether drugs administered to 2546 patients with cardiopulmonary arrest received included candidate drugs, and found that eleven drugs were included. In addition, as a result of the binomial logistic regression analysis, three agents, nitroglycerin, isosorbide dinitrate and thiopental, were obtained as agents showing significant association with survival to discharge. Analysis of these drugs in detail by the Inverse probability of treatment weighting method using propensity score showed that the adjusted odds ratios for survival to discharge of nitroglycerin, isosorbide nitrate and thiopental administration group were 4.56, 3.53 and 1.66, respectively.

**Conclusion:** Drug repositioning research using large-scale medical information revealed that nitroglycerin, isosorbide nitrate, thiopental improved the survival to discharge rate of patients with cardiopulmonary arrest. From these results, we found that these three drugs can be a novel therapeutic agent for cardiopulmonary resuscitation syndrome. Furthermore, high-throughput screening and in silico analyses based on large-scale medical databases aimed at drug repositioning will lead to the clinical management of cardiopulmonary resuscitation syndrome with many therapeutic agents.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-056

Poster Title: Prescribing patterns of dipeptidyl peptidase-4 inhibitors and glucagon-like peptide-1 agonists in the Lebanese community

Primary Author: Samar Abdessater, La Gospa Pharmacy; Email: samar.abdessater@gmail.com

Additional Author(s):
Mariam Dabbous
Pamela Whaiby
Fouad Sakr
Michelle Cherfan

Purpose: Ingested glucose stimulates a greater insulin secretion than injected glucose into the bloodstream. This is the basis of the use of glucagon-like peptide-1 (GLP-1) agonists and dipeptidyl peptidase-4 (DPP-4) inhibitors, to manage diabetes mellitus type II. Those agents stimulate insulin production and secretion from the pancreatic beta cells in a glucose-dependent manner, improve gastric emptying, favor weight reduction, and reduce post-absorptive glucagon secretion from pancreatic alpha cells. The purpose of this study is to analyze the utilization patterns of GLP-1 agonists and DPP-4 inhibitors, and assess factors that are associated with their prescription in type 2 diabetic Lebanese patients.

Methods: This multi-center observational study was approved by the institutional review board of the Lebanese International University. It was conducted over a period of 7 months in major Lebanese community pharmacies. An informed consent was obtained. All type 2 diabetic patients who were presenting with a prescription of a GLP-1 agonist or DPP-4 inhibitor were included. Patients with type 1 diabetes mellitus and those less than 18 years of age were excluded. A structured survey with close and open ended questions was used to assess demographics, co-morbidities, glycemic levels, and diabetes medications used with dose, duration, as well as encountered adverse events. The primary outcome was to assess the usage of DPP-4 inhibitors and GLP-1 agonists. The secondary outcomes were to determine the frequency of agents used in each class, and the factors that are associated with the prescription pattern of each. Statistical analysis was performed using SPSS software version 23.0, and presented as frequency, means, and standard deviations. A Pearson chi square p-value of less than 0.05 was considered to indicate statistical significance and binary logistic regression identified risk factors that were associated with prescribing GLP-1 agonists or DPP-4 inhibitors.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: A total of 550 patients were screened. Only 250 patients met the eligibility criteria and were enrolled in the study. 80.4 percent of the patients were prescribed a DPP-4 inhibitor versus 19.6 percent for a GLP-1 agonist. The mean fasting blood glucose in DPP-4 inhibitors and GLP-1 agonists groups were 171.5 and 176 respectively. For the secondary outcome measures, sitagliptin was the most commonly prescribed agent among the DPP-4 inhibitors (53.7 percent) followed by vildagliptin, linagliptin and saxagliptin (25.4 percent, 14.4 percent, and 6.5 percent respectively). As for the GLP-1 agonists, liraglutide was the most agent used (89.8 percent), followed by dulaglutide and exenatide (8.2 percent and 2 percent respectively). Factors associated with the choice of DPP-4 inhibitors over GLP-1 agonists included hypertension (58.7 percent versus 34.7 percent; P equals 0.002 Odds ratio [OR] equals 2.4), and the concomitant use of beta blockers (31.8 percent versus 18.4 percent; P equals 0.04, OR equals1.07), as well as fibrates (27.9 percent versus 12.2 percent; P equals 0.023, OR equals 2.5). The majority of patients taking GLP-1 agonists were overweight. A significant association between increased body mass index (BMI) and the use of GLP-1 agonists was observed (P equals 0.025).

Conclusion: Sitagliptin and vildagliptin are the most commonly used agents among DPP-4 inhibitors, while liraglutide is the most common among the GLP-1 agonists. Factors significantly associated with prescribing DPP-4 inhibitors include hypertension and dyslipidemia, with concurrent use of beta blockers and fibrates. On the other hand, large BMI was significantly associated with prescribing GLP-1 agonists. In short, identification of factors underlying the use of those drugs may help pharmacists to promote rational use of them, and optimize diabetic patients care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-057

**Poster Title:** Comparison of periarticular liposomal bupivacaine versus an alternative cocktail for postoperative pain management after hip or knee surgery

**Primary Author:** Sara Badagliacqua, Cardinal Health; **Email:** sara.badagliacqua@cardinalhealth.com

**Additional Author(s):** Mike Mesdaghí

**Purpose:** Liposomal bupivacaine suspension has been used intra-operatively during hip and knee replacement surgeries in order to assist with pain control for up to 72-hours postoperatively, decrease opioid consumption, and decrease hospital length of stay. Previous medication use evaluations conducted by the facility have demonstrated a positive response to liposomal bupivacaine (used alone and in combination with other agents) in the postoperative period. However, given the high cost of liposomal bupivacaine, alternative periarticular pain cocktails have been implemented. This retrospective review compared the effectiveness of liposomal bupivacaine to an alternative periarticular cocktail used in orthopedic surgeries.

**Methods:** This single-center, retrospective cohort study compared the use of liposomal bupivacaine with that of a cocktail comprised of bupivacaine hydrochloride, epinephrine, morphine, ketorolac, ropivacaine, and dexamethasone. A total of 114 charts were reviewed for the time period of January 1, 2017 through April 30, 2017. Forty-nine patients received liposomal bupivacaine and 65 patients received alternate therapy. All patients participated in the hospital’s multimodal postoperative pain management pathway. Length of stay, opioid use for 72 hours postoperatively, and pain scores were evaluated.

**Results:** No significant differences were found between patients receiving liposomal bupivacaine and the alternative cocktail (bupivacaine hydrochloride, epinephrine, morphine, ketorolac, ropivacaine, and dexamethasone) with regard to length of stay and postoperative opioid use.

**Conclusion:** Liposomal bupivacaine does not offer any additional benefit over the alternative periarticular cocktail used within the hospital for patients undergoing hip or knee replacement surgery.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-058

Poster Title: Cost containment of intravenous acetaminophen use in a county health system

Primary Author: Erika Bergeron, Harris Health System; Email: erika.bergeron@harrishealth.org

Additional Author(s):
Jacqueline Milton-Brown

Purpose: Controlling rising pharmaceutical cost while preserving the standard of care in a county health system is an enormous challenge. The use of intravenous acetaminophen in the system has increasingly become a large expenditure with a price increase of about 218 percent since its addition to the formulary. Intravenous acetaminophen is FDA indicated for the management of mild to moderate pain, the management of moderate to severe pain with adjunctive opioid analgesics and the reduction of fever. The purpose of this evaluation is to assess the utilization, compliance and cost of intravenous acetaminophen in a county hospital.

Methods: An initial retrospective electronic utilization report from May 2016 to July 2016 was obtained from the internal Information Systems department for one thousand two hundred and twelve patients who received IV acetaminophen. The report characteristics included patient identifiers, month of administration, location, department, and number of doses. An expense report was generated via the health system’s designated wholesaler for purchases made during that time. Following the implementation of an action plan that required physicians to self-police IV acetaminophen use, utilization and expense reports were generated and reported monthly to follow trends in use and purchases. The post-implementation review assessed one thousand eight hundred and seventy-two patients from August 2016 to May 2017.

Results: Three thousand and ninety-nine unique patients were reviewed during the twelve month evaluation period. From May 2016 to July 2016, there were a total of 2,356 IV acetaminophen doses dispensed, which valued $83,402.40. The implementation of an action plan for physician self-monitored usage was initiated in August 2016. Following implementation, there were a total of 4,218 doses from August 2016 through May 2017, which valued about $154,006.64. Similarly, purchases made prior to the action plan implementation totaled $165,672 for the three month period. Following the plan implementation, the pharmacy department spent $154,006.64 for the remainder of the assessment period. The

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
latter expenditures include a cost increase by the product’s manufacturer in January of the evaluation period.

**Conclusion:** An average of seven hundred and eighty-five doses of IV acetaminophen was dispensed from May 2016 to July 2016. There was an average of four hundred and twenty-one doses dispensed from August 2016 to May 2017. There was an overall 46 percent decrease in the use of IV acetaminophen from August 2016 to May 2017 following the implementation of the physician-driven action plan. The reduction of IV acetaminophen use has not only reduced pharmacy expenditures but has also prompted the department to explore other avenues of potential cost savings.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-059

Poster Title: Pharmacoeconomic cost reduction collaboration to reduce anesthetic gas use

Primary Author: Erika Bergeron, Harris Health System; Email: erika.bergeron@harrishealth.org

Additional Author(s):
Jacqueline Milton-Brown

Purpose: While inhalational anesthetic agents are a vital part of patient care in the operating room, medication expenditures may account for a large part of a pharmacy’s budget. Inhaled anesthetic drug costs are calculated by minimum alveolar concentration (MAC) hours, which is dependent on the Fresh Gas Flow (FGF) rate of a gas during a procedure. Studies conducted at other institutions have shown that adjusting the FGF may contribute to a reduction in medication expenditures for inhalational anesthetic gases. The purpose of this evaluation is to assess whether a reduction of FGF rates during surgical procedures would reduce the use of inhalational anesthetics.

Methods: Anesthesiologists at the study pavilion were asked to decrease patient FGF from 2 L/min to 1 L/min for all inhalational anesthetics (wherever possible) during a six month period. The anesthesiologists were instructed to monitor FGF when rounding in the operating room. Departmental education to the Stakeholders (faculty, CRNAs, residents) for the project was provided by the service chief. An expense report was generated via the health system’s designated wholesaler for purchases made prior to the evaluation period and six months following the implementation of the project to assess for a reduction in anesthetic gas expenditures.

Results: Between March 2015 and August 2015, the hospital spent $65,790.81 on sevoflurane, $44,394.51 on desflurane, and $376.35 on isoflurane. Between March 2016 and August 2016, the hospital spent $51,582.95 on sevoflurane, $39,582.95 on desflurane, and $0 on isoflurane. The cost difference between the two assessment periods for sevoflurane, desflurane, and isoflurane was $14,207.84, $4,811.56, and $376.35 respectively.

Conclusion: Low FGF rates have contributed to a reduction in expenditures for inhaled anesthetics in a six month period. There was a twenty-two percent reduction in sevoflurane expenditures, a cost savings of $14,207.84; eleven percent reduction in desflurane

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
expenditures, a cost savings of $4,811.56; and a 100% reduction in isoflurane purchases, resulting in $376.35 of cost savings. The total cost savings for all three inhaled gases during this time was $19,395.75. Due to the success of the project, the anesthesiology department continues to encourage the “Go Low” project to optimize cost savings and further reduce expenditures. Similar initiatives have been implemented at another hospital in the health system. The health system continues to benefit from the reduction in FGF.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-060

Poster Title: Real-world efficacy and safety of ibrutinib: a single institutional experience

Primary Author: Maria Castro, Son Espases Hospital; Email: maria.castromananares@ssib.es

Additional Author(s):
Jorge Gines
Antonio Gutierrez
Pilar Rovira
Barbara Boyeras

Purpose: Ibrutinib is a first-in-class, covalent inhibitor of Bruton's tyrosine kinase (BTK). BTK is involved in the pathogenesis of various B cell neoplasms including follicular lymphoma, diffuse large B-cell lymphoma (DLBCL), mantle cell lymphoma (MCL), and chronic lymphatic leukemia (CLL).
In Spain, it is approved for the treatment of patients with mantle cell lymphoma (MCL), chronic lymphocytic leukemia (CLL) and for Waldenstrom macroglobulinemia (WM).
We aim to analyze the efficacy and safety of ibrutinib in patients treated at a tertiary care hospital.

Methods: We retrospectively reviewed all cases treated with ibrutinib in our hospital from February 2015 to June 2017. Demographics (age, sex), indication (MCL, CLL, WM, others), clinical features (chromosome 17 deletion, TP53 mutation), treatment (line and duration of treatment, response assessment) and toxicity variables were collected from medical records (Millennium-Cerner - (R), and from the electronic prescription software for antineoplastic drugs (Farmis-Oncofarm - (R)). Adverse events were classified according to National Cancer Institute Common Terminology Criteria (version 4.0). Patients treated with ibrutinib in a clinical trial and those receiving the drug for a period of less than 1 month were excluded from the study.
Up to the cut-off date, a total of 13 patients (8 males and 5 females) have received Ibrutinib. The median age was 68 years (range 50-87). In 5 cases ibrutinib was indicated for CLL (2 cases with del17, no case with TP53 mutation), 4 for MCL, and 1 case for WM. The remaining 3 cases correspond to off label indications: 1 Richter’s Syndrome (RS) (CLL-DLBCL), and 2 primary central nervous system lymphoma (PCNSL). Two of the patients received ibrutinib as first line therapy, while the remaining eleven had received at least one previous treatment. The dose

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
used was 420 mg/day in the cases of CLL, WM and RS and 560 mg/day for MCL and PCNSL. The median duration of treatment was 15 months (range 2-25).

**Results:** The response could be evaluated in the 13 patients. The overall response rate was 92.3% (6 complete response (CR) and 6 partial response (PR)), with 1 stable disease (SD). If we analyze the responses according to the indication: in CLL patients, 2 patients achieved CR and 3 PR; in MCL patients, CR was obtained in 3 while the other one only obtained SD; The WM achieved a very good PR (90% reduction in serum monoclonal IgM). The patient with RS achieved PR and the patients with PCNSL obtained 1 CR and 1 PR.A total of 3 patients received ibrutinib in combination with an Anti-CD20 Antibody (Obinutuzumab) as an off-label combination treatment. Nine patients are still under treatment, two discontinued treatment due to disease progression and two died for other reasons (renal carcinoma and infection). A total of 5 patients suffered grade 3 or 4 adverse events (AEs): 3 cases of hematological toxicity (mainly neutropenia) and one case of diarrhea and asthenia respectively. 6 patients eventually discontinued the treatment and then reintroduced, in 2 of them with a dose reduction.

**Conclusion:** In clinical practice, ibrutinib as a single agent provide encouraging results for the targeted therapy of B-cell lymphoproliferative malignancies with an acceptable safety profile. Our experience indicates that ibrutinib combined with an anti-CD20 monoclonal antibody is feasible, showing synergistic and complementary activity in patients with malignant B-cell neoplasms, and constitutes a focus of research in an attempt to improve the response quality. At the same time, its ability to cross the blood-brain barrier opens the possibility of being used in lymphomas with CNS involvement.
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-061

**Poster Title:** Human prothrombin complex concentrate utilization evaluation at a community hospital

**Primary Author:** Marsha Crader, University of Arkansas for Medical Sciences College of Pharmacy; **Email:** mfcrader@uams.edu

**Additional Author(s):**
Rebecca Smith

**Purpose:** Human prothrombin complex concentrate (PCC), an antidote for warfarin, has Food and Drug Administration (FDA) labeled indications including urgent anticoagulation reversal in patients with acute, major bleeding or who need urgent surgery or invasive procedures. PCC has an FDA boxed warning related to arterial and venous thromboembolic complications. In an effort to ensure patient safety, a community hospital’s Pharmacy and Therapeutics Committee completed a medication utilization evaluation to identify if PCC was used appropriately and if its use led to any adverse events.

**Methods:** All patients admitted to the hospital during 2016 who received PCC were included in the retrospective review. Each patient’s electronic medical record was reviewed, and the following information was collected: anticoagulant used prior to PCC administration (i.e., warfarin, another oral anticoagulant, or none), PCC indication, PCC dosing, vitamin K usage, international normalized ratio (INR) levels, and Hepatitis B vaccination. Adverse events (i.e., continued or newly developed bleeding, thrombotic events, and death) as well as readmission within 30 days related to clot formation were also recorded. Potential adverse drug reactions were assessed using the Naranjo Algorithm to identify the probability (i.e., doubtful, possible, probable, definite) of the event being caused by the PCC.

**Results:** Fifteen patients received PCC during 2016. Prior to PCC administration, seven (47 percent) patients received warfarin, five (33 percent) received another oral anticoagulant, and three (20 percent) had not received an anticoagulant. The most common documented PCC indications included intracranial hemorrhage (5; 33 percent), gastrointestinal bleed (3; 20 percent), and surgery (3; 20 percent). All patients received the recommended unit per kilogram dose except for three patients. Eight (53 percent) patients received vitamin K concurrently or prior to PCC administration. Only one patient did not have an INR collected prior to PCC.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
administration. The time until first INR check after PCC administration varied between 10 minutes and 48 hours. No patients received the Hepatitis B vaccine prior to hospital discharge. Four (27 percent) patients continued to bleed after PCC administration. No clot formation was noted during admission or within 30 days post-discharge. One patient had possible disseminated intravascular coagulation prior to transfer to another facility, and seven (47 percent) patients died during the admission when PCC was utilized. All adverse drug reactions were categorized as having a possible association with PCC according to the Naranjo Algorithm.

**Conclusion:** PCC is an anticoagulation reversal option, but it must be used appropriately and carefully monitored to prevent adverse drug events. PCC was utilized at a community hospital primarily for patients with serious bleeding and pending surgeries. Although no adverse events encountered could be directly associated with PCC, it is imperative that hospitals ensure proper education and processes are in place to facilitate proper dosing, usage, and monitoring of PCC.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-062

**Poster Title:** Balancing innovative cancer care and protection of institutional resources: Outcomes of a novel formulary management approach.

**Primary Author:** David Crowther, UT MD Anderson Cancer Center; **Email:** dmcrowther@mdanderson.org

**Additional Author(s):**
Stacey Sobocinski  
Mara Villanueva  
Adriana Rivera  
Wendy Heck

**Purpose:** Trying to balance cutting-edge cancer care while protecting institutional resources became a significant concern as the formulary management system faced increasing requests for high-cost, cancer therapy with minimal supporting evidence. As a result, the Formulary Management Escalation Team (FMET) was created to review these requests. FMET is a multidisciplinary team of 60% physicians, including representatives from senior institutional and pharmacy leadership, legal services, and clinical ethics. This project was designed to analyze the escalation process, as well as the clinical and financial outcomes of requests. The analysis is an ongoing effort and additional results will be incorporated when collected.

**Methods:** Requests reviewed by FMET from September 15, 2014 through November 30, 2016 were included in the initial analysis. Documentation from the electronic health record was used to determine the clinical outcome of requests. Requests for patients experiencing complete response, partial response, or stable disease were classified as having positive outcome. Negative outcomes included disease progression, death prior to restaging scans, and discontinuation of treatment due to an adverse drug event. Any requests for patients lost to follow-up or not having sufficient information to assess the clinical outcome were classified as unknown. Financial outcomes were assessed by revenue cycle specialists to determine medication charge reimbursement. Requests were classified by the level of supporting evidence to identify associated trends in insurance reimbursement.

**Results:** In the specified time range, 129 requests required review by the FMET. Of the requests, 67% were approved, 30% were denied, and 3% received conditional approval but

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
were not pursued further. Among the 86 requests approved by the FMET, 67 (78%) patients received the requested therapy. The clinical outcomes for approved requests in these 67 patients were positive in 34%, negative in 58%, and unknown in 8%. Denied requests went on to receive the following therapy: standard-of-care (41%), clinical trial enrollment (23%), requested therapy through an outside facility or patient assistance program (8%), another innovative off-label therapy (5%), or none (23%). Clinical outcomes for denied requests were positive in 13%, negative in 56%, and unknown in 26%. In assessing the financial outcomes for the 67 approved requests where the patient received the requested therapy, 79% were paid, 15% were written-off as a financial loss, and 6% were provided free of charge by a patient assistance program. In total, the FMET generated a minimum of $385,942 in cost avoidance based on institutional average length of stay of 7 days.

**Conclusion:** Overall the formulary management escalation process is a value-added system for systematically addressing difficult requests for off-label medication use. It increases transparency and mitigates financial risk to the institution. Denial of requests promoted evidence-based medicine and/or clinical trial enrollment, to help contribute to generalizable knowledge.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-063

**Poster Title:** Compliance with drug-use process steps in care units: a cross-sectional observational study

**Primary Author:** Eléonore Holscher, CHU Ste Justine; **Email:** eleonore.holscher.hsj@ssss.gouv.qc.ca

**Additional Author (s):**
Suzanne Atkinson
Stéphanie Duval
Véronique Pelchat
Jean-François Bussières

**Purpose:** The drug-use process is complex and includes 54 steps in hospitals. Nurses are involved in at least 14 steps of the process to ensure safe planning, compounding, administration and documentation of drugs. Laws, bylas, norms and local policies and procedures are adopted to support the safe use of drugs by all stakeholders. To ensure the compliance to this safety framework, periodical audits are conducted. We have been monitoring the compliance with drug-use process since 2007 in our hospital.

**Methods:** This cross-sectional prospective observational study was conducted in a Mother-child Hospital Center. The primary objective was to describe the nursing staff compliance per care unit, and per drug-use process step in 2017. A total of 9 inpatient care units (e.g. pediatric intensive care, neonatology intensive care, hemato-oncology, surgery, pediatric, psychiatric, rehabilitation, obstétric-gynecologic, birthing unit) and 2 outpatient care units (emergency room and day care center) were included. A total of 79 variables were collected including demographics and descriptive variables (n=18) and compliance criteria (n=61). In 2017, compliance criteria were divided according nine categories (e.g. initial steps for any dose (n=7), initial steps when compounding must be completed by the nurse (n=5), enteral drug preparation (n=5), parenteral drug preparation (n=8), labeling and documentation for compounded drugs by the nurse (n=5), ready-to-use drug (n=6), independent double check (n=9), bedside drug administration (n=16). The compliance to drug-use process was measured using a paper pre-tested grid (n=10 observations) with one the 48 observers trained according a standardized technique. A criteria could be quoted compliant, non compliant or not applicable. A target of 45 observations per care units (maximum of three observations by observed nurses)

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
was established with at least 50% of the doses being administered during the day and 25% for the two other shifts. A compliance rate was calculated globally and by categories of drug-use steps.

**Results:** A total of 494 drug doses were audited in March 2017 during day (45.5%), evening (32.0%) and night shifts (22.5%). Drug doses were either parenteral (51.2%) or enteral (48.8%). A majority (52.4%) of doses was not ready-to-use and required some preparation by nurses. Only 63 of the 494 drug doses (12.8%) were fully compliant to all applicable criteria. Per categories of drug-use process, the compliance rate were respectively: initial steps for any dose (80.5%), initial steps when compounding must be completed by the nurse (51.0%), enteral drug preparation (79.2%), parenteral drug preparation excluding the criteria about the use of a fluid dispensing connector (90.8%), labeling and documentation for compounded drugs by nurses (34.5%), ready-to-use drug (61.9%), independent double check (39.9%), bedside drug administration (30.6%). An average of one interruption/dose has been observed. Eleven corrective measures were proposed to improve compliance. Key measures included a redesigned pre-printed label for drug labeling by nurses post-preparation, a revised independent double check procedures, a revised procedure for the use of a fluid dispensing connector, a revised procedure for the use of smart pump, a focus group with each care unit to share the results and discuss local actions including strategies to prevent nurses' interruption.

**Conclusion:** This cross-sectional study highlights a low global compliance rate (12.8%) of inpatient drug-use process steps in care units. However, the compliance rate per categories of drug-use process steps is higher between 30.6 and 90.8%. Full compliance to such a high number of criteria represents a challenge for nurses, considering the daily workload and the patient care provided. Periodical audit of the drug-use process should be performed to insure patient safety.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-064

Poster Title: Characterizing the nature of research in pediatric polypharmacy: a scoping review

Primary Author: Alexis Horace, University of Louisiana at Monroe School of Pharmacy; Email: horace@ulm.edu

Additional Author(s):
Hannah Johnson
Negar Golchin
Jennifer Staley
Paul Bakaki

Purpose: Pediatric polypharmacy (PP), the practice of administering or taking multiple medications among children, is known to be a source of both benefits and harms depending on certain disease states. Despite the importance of understanding its effects, current literature has been inconsistent in the way polypharmacy in children is defined and measured. This makes understanding prevalence and outcomes across different patient groups and clinical specialties challenging. The objective of this research was to identify studies that assessed PP and to describe these studies by design, geographical distribution, disease conditions, medication variables, outcomes, and harms.

Methods: An interdisciplinary team of individuals was recruited including physicians, epidemiologists, bio-statisticians, pharmacists, and a librarian. To locate studies, controlled vocabulary and keyword terms for the concepts of PP were searched using Medline, Embase, CINAHL, PsycINFO, and Web of Science Core Collection. Studies which defined or assessed PP as an aim, outcome, predictor, or covariate were included and transferred to EPPI-Reviewer 4 (EPPI-Centre, 2010), a web-based software platform that organizes studies and holds extracted data. Each article was further reviewed by two team members for inclusion or exclusion by screening on title, abstract, and full text. Conflicts were resolved by consensus. Then data was collected using standardized data extraction forms and then synthesized to address our objective.

Results: We report findings from the first 100 citations. Of these 100 articles, 22 studies met inclusion criteria. Studies were conducted mainly in Asia (50%) and the United States (23%).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Study designs were mainly retrospective cohort (41%) and cross-sectional studies (32%). Of the 22 included studies, the majority examined solely pediatric patients (91%). Seventeen (77%) of the studies defined polypharmacy, six (27%) had polypharmacy as an outcome, five (23%) had polypharmacy as a main predictor, 20 (91%) estimated the prevalence of polypharmacy, and 13 (59%) assessed its harms. Neurology (55%) and psychiatry (36%) were the most frequent disease groups studied with epilepsy (50%) and attention deficit disorder (23%) the most frequent disease states. Anticonvulsants (60%) were the leading medication class studied by our sample.

**Conclusion:** While research on PP is diverse in design, aims, outcomes, polypharmacy assessment, and geographical distribution, it is dominated by evaluation of concurrent medications for treating neurological and psychiatric conditions. This project provides promising results regarding the global impact and scope of PP in current literature. The structure and methodology of this research will provide an accurate assessment of the breadth of PP. We anticipate that the results from our study will provide valuable information to inspire further research.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-065

Poster Title: Development and clinical application of management tool to monitor side effects for atypical antipsychotics

Primary Author: Shunsuke Ishida, Department of Pharmacy, Tokushima University Hospital; Email: ishida.shunsuke@tokushima-u.ac.jp

Additional Author (s):
Hiroshi Bando
Kenshi Takechi
Yoshito Zamami
Keisuke Ishizawa

Purpose: There is a description about conducting periodic clinical examination in the "warning" of the drug package insert. In particular, atypical antipsychotic drugs may cause hyperglycemia or diabetic ketoacidosis. Due to this, the ward pharmacist needs to check clinical laboratory values for each patient and monitor side effects so that serious side effects do not occur. However, these tasks require much work and time. Therefore, we developed a database with a program capable of monitoring side effects with clinical laboratory values as an indicator. Furthermore, we evaluated the clinical effect of introducing this database.

Methods: We developed protocols for prescribing intervention procedures by pharmacists after administering atypical antipsychotics and procedures for requesting examination orders by pharmacists. For interventions, patients included were those on atypical antipsychotics quetiapine, aripiprazole, olanzapine who were admitted to our psychiatric ward from May 2016 to January 2017. Among the target patients, those patients who were administrated with these drugs as required were excluded. Using Filemaker Pro 13 advanced, we constructed a database that enables easy monitoring of the blood glucose level of patients who were prescribed with these medicines. To extract data from the electronic medical record, data warehouse was used in the Excel format, and the automatic calculation program was added to incorporate the next examination date into the database software. As a result, we asked the doctor for a clinical examination order so that clinical examination can be carried out at an appropriate time. We evaluated the clinical examination implementation rate and working hours before and after the database introduction. The evaluation of working hours was tested using the t-test.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: In the database, a list of patients undergoing atypical antipsychotic medication can be browsed, and grades based on CTCAE v4.0 and the time of next clinical examination can be displayed automatically from their clinical examination values. As a result of monitoring using the created database, 638 prescriptions were available during the period, and it was possible to monitor adverse reactions of 25 patients on a monthly average. We confirmed two patients diagnosed as "borderline" or "suspected diabetes" before administering antipsychotic drugs, but both patients were relieved and were not diagnosed with diabetes thereafter. Also, while administering antipsychotic drugs, one patient was diagnosed as "suspected diabetes", but thereafter it was alleviated without becoming severe. As a result of requesting clinical examination order based on the protocol the pharmacist made to the doctor, the implementation rate of the clinical examination was 71.9% before introducing the management tool, whereas the rate increased to 89.4% after the introduction. In addition, as a result of comparing business hours before and after introducing the management tool, the working hours were reduced by about 3 hours per month.

Conclusion: Seamless intervention by a pharmacist using the developed database made it possible to cooperate with the doctor and request blood glucose level measurement at a proper time for a patient who are prescribed with antipsychotics. As a result, it was possible to collect as a pre-avoid case where the examination value was abnormal before and after drug administration, and no onset of diabetes was observed. I believe that the pharmacists can provide the same quality of medical care to all prescribed patients regardless of skills and years of experience as pharmacists with this database tool.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
2017 Midyear Clinical Meeting Professional Poster Abstracts

Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-066

Poster Title: Pattern of anti-hypertensive drug use and the extent of blood pressure control in Lebanese patients

Primary Author: Rana Jaafar, FDC; Email: rana_jaafar@hotmail.com

Additional Author(s):
Fouad Sakr
Rawan Barakat
Mariam Dabbous
Mohamad Iskandarani

Purpose: Hypertension increases the risk of heart diseases and stroke, which are among the most common causes of death in the United States. In Lebanon, few data exists on anti-hypertensive drug use. Hypertension medications are available as monotherapy, double, triple or a fixed dose combination (FDC). This study was conducted to determine the extent of blood pressure control in Lebanon and to study the effect of anti-hypertensive drugs in achieving the blood pressure goal based on JNC8 guideline target values.

Methods: This cross-sectional observational study was approved by the institutional review board. Patients were recruited from major community pharmacies over Lebanon. All adult hypertensive patients aged 18 and more on any anti-hypertensive drug were included. Pregnant women or hypertensive patients who are not on any hypertension medication were excluded from the study. After having the informed consent being signed, questionnaires were filled regarding demographic data, social history, lifestyle measures, and drugs taken. Moreover, blood pressure was measured using digital monitors. The primary outcome was to evaluate the pattern of anti-hypertensive drug use by Lebanese hypertensive patients. The secondary outcome was to evaluate the role of all anti-hypertensive drugs in attaining blood pressure goal based on the JNC8 guideline set blood pressure goals. Data are expressed as frequencies, and evaluation of primary and secondary outcomes utilized analysis of logistic regression.

Results: 500 patients were enrolled in the study. Among them, 293 were at the set goal of blood pressure. Most patients were on monotherapy (41.8 percent) followed by FDC (33.2 percent). Among all prescribed anti-hypertensive classes, angiotensin receptor blockers (ARBs)
were the most prescribed class (45 percent); whereas, beta blockers were the most common prescribed monotherapy (35.88 percent). For the secondary outcome measure, the results of logistic regression show that patients receiving monotherapy, double therapy, or FDC are more likely to be at the blood pressure goal than those receiving triple or quadruple therapy (P equal 0.01, 0.009, and 0.002 respectively).

**Conclusion:** Managing hypertension require the individualization of each patient treatment. The results of our study underline the patterns of anti-hypertensive drug use in the Lebanese community, while focusing on the importance of drugs in attaining a controlled blood pressure based on the JNC8 set blood pressure goals. Hence, pharmacists should continue working with other healthcare members to achieve better guidelines adherence to have better blood pressure control. As well, community pharmacists should further educate their patients about the importance of drug compliance to achieve this goal.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-067

Poster Title: Proton pump inhibitor and histamine 2 receptor antagonist use in adults taking clopidogrel from 2007-2014

Primary Author: Shanique James, Nova Southeastern University; Email: sj1091@nova.edu

Additional Author(s):
Amie Armbrister
Claudia Nunez Chiang
Annette Vidal
Alexandra Perez

Purpose: Clopidogrel, an antiplatelet prodrug approved for the prevention of cardiovascular events, can increase the risk of gastrointestinal bleeding; therefore, proton pump inhibitors are oftentimes prescribed. Prior to 2007, studies revealed an interaction between clopidogrel and proton pump inhibitors since they both involve the CYP2C19 enzyme, resulting in a decreased antiplatelet effect of clopidogrel. However, recent studies show inconclusive results regarding this interaction. Our purpose was to assess the trend in use, between 2007-2014, of adults taking either a proton pump inhibitor or a histamine 2 receptor antagonist as a class and individually with clopidogrel alone or in combination with aspirin.

Methods: A secondary database analysis of a cross-sectional survey was conducted using data retrieved from the National Health and Nutrition Examination Survey between 2007 and 2014. The inclusion criteria consisted of men and women 20 years of age and older who were on clopidogrel alone or in combination with aspirin. The trend of use of proton pump inhibitors such as omeprazole, esomeprazole, pantoprazole, lansoprazole, rabeprazole and dexlansoprazole and histamine 2 receptor antagonists such as ranitidine, famotidine, nizatidine, and cimetidine were evaluated. Medication use data were collected within 30 days prior to survey date. Chi-square and one-way ANOVA statistical tests were used to compare categorical and continuous characteristics and outcomes across survey cohorts. All estimates were adjusted for complex sampling design. The National Center for Health Statistics Institutional Review Board approved the research proposal for NHANES and was exempt from Nova Southeastern University Institutional Review Board approval.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: Overall, in adults taking clopidogrel, proton pump inhibitor (PPI) use appeared to decrease from 2007-2008 to 2011-2012, but then it appeared to increase in 2013-2014 (p > 0.05). There was a trend toward increased use in histamine 2 receptor antagonists (H2RA) from 2007-2008 to 2011-2012, but then it decreased in 2013-2014 (p > 0.05). Between 2007-2008 and 2013-2014, the use of pantoprazole increased (p = 0.005) while the use of lansoprazole decreased (p = 0.008). From 2007-2008 and 2013-2014, there was a downward trend in omeprazole use (p > 0.05). Due to a small sample size, evaluation of proton pump inhibitor and histamine 2 receptor antagonist use in those on clopidogrel and aspirin was not conducted.

Conclusion: Despite labeling changes and recommendations to avoid concomitant use of PPIs with clopidogrel, overall PPI use was 20 to 28 percent. On the other hand, H2RA use was less than 10 percent even though they are considered a viable alternative to PPIs. As more data becomes available regarding the interaction between clopidogrel and PPIs, trends in use of PPIs and H2RAs will continue to vary. Therefore, prescribers’ awareness of this interaction should be promoted and future studies should evaluate the use of PPIs with dual antiplatelet therapy in adults with a high risk of gastrointestinal bleeding.
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-068

**Poster Title:** Combining selective dual orexin receptor antagonist with melatonin receptor agonists does not increase the incidence of delirium in acute stroke patients

**Primary Author:** Kei Kawada, Kochi Health Sciences Center; **Email:** kei_kawada1979@yahoo.co.jp

**Additional Author (s):**
Tsuyoshi Ohta
Norifumi Miyamoto

**Purpose:** Delirium is frequently observed in acute stroke patients and is associated with increased morbidity and mortality. Melatonin receptor agonist reportedly reduces the occurrence of delirium; however, it may not improve the subjective sleep parameters significantly. It is unclear which sleeping pills should be used along with the melatonin receptor agonist to improve its effectiveness. We investigated the safety issues and effectiveness of combining sleeping pills with melatonin receptor agonist in treating sleep disturbance and delirium in acute stroke patients.

**Methods:** This was a retrospective, non-blinded, cohort study involving acute stroke patients treated between April 2013 and March 2017 at Kochi Health Sciences Center. Our institutional ethics review board approved this study. Overall, 74 patients who died within 3 days of admission, 38 patients who were prescribed with antipsychotics, 648 patients who did not receive sleeping pills, and 490 patients who received only melatonin receptor agonist were excluded from the study. In total, 225 patients who received melatonin receptor agonist in combination with either alpha aminobutyric acid receptor (GABA) agonists or selective dual orexin receptor antagonist (DORA) were included in the study. The patients who were classified as grade 2 or higher according to the Richmond Agitation Sedation Scale as well as received antipsychotics within 14 days of admission were diagnosed with delirium. Patient characteristics, past medical history, clinical conditions, and treatment details were collected and analyzed to study the occurrence of delirium. Fisher’s exact test was used to compare the categorical variables, and the Mann-Whitney U test was employed to compare the ratio or ordinal variables. P value less than 0.05 was considered statistically significant.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** In addition to melatonin receptor agonist, 101 patients received GABA agonists (GABA agonists group) and 124 patients received DORA (DORA group). Patient characteristics did not differ significantly between the groups, except for two types of stroke (cerebral infarction, P equal to 0.03; intracerebral hemorrhage, P equal to 0.004). The incidence of delirium was significantly higher in the GABA agonists group (30.7 percent versus 6.5 percent, P less than 0.001). The variables, which showed significant changes on univariate analyses, include the use of GABA agonists (OR 6.37, 95 percent CI, 2.67 to 16.96, P less than 0.001), habitual use of alcohol (OR 2.43, 95 percent CI, 1.11 to 5.44, P equal to 0.051), severe neurological deficits on admission (OR 2.11, 95 percent CI, 0.99 to 4.63, P equals to 0.004), and higher age [years, (median, 25 percent to 75 percent interquartile range) 78, 70 to 84 versus 74, 63 to 84, P equal to 0.04]. Multiple logistic regression analysis using the same variables showed that only GABA agonists were significantly associated with delirium (OR 5.62, 95 percent CI, 2.38 to 13.30, P less than 0.001).

**Conclusion:** In acute stroke patients with prescribed melatonin receptor agonists, addition of GABA agonists, not DOAR, is significantly associated with the frequent occurrence of delirium. To safely improve the sleeping disturbance in acute stroke patients, prescribing melatonin receptor agonists along with DORA could be the better choice.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-069

Poster Title: Assessment of dual anti-platelet therapy use and patients’ level of therapy awareness in the Lebanese community

Primary Author: Rawan Khankan, Lebanese International University; Email: rawankhankan@gmail.com

Additional Author(s):
Aya Lteif
Fouad Sakr
Mariam Dabbous
Jihan Safwan

Purpose: Atherosclerotic and cardiovascular diseases are leading causes of global mortality. Anti-platelet agents are used as a cornerstone of therapy for patients with those conditions. In Lebanon, different patients with different risk factors are prescribed dual anti-platelet agents for a long period of time. This study assesses different factors associated with dual anti-platelet therapy (DAPT) use; as well as, evaluates patients’ knowledge and level of awareness about this therapy in the Lebanese community.

Methods: This prospective observational study was approved by the institutional review board. It was a randomized multicenter study. The study was conducted in major community pharmacies in Beirut selected by randomization over 3 months. Patients with no known atherosclerotic cardiovascular disease (ASCVD) were excluded, as well as pregnant females and children. A questionnaire was filled including demographic information, patients’ weight, smoking status, medical history, and previous procedures and surgeries particularly percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), as well as angiography; and the timing of the procedure. The questionnaire also assessed concomitant drug use and co-morbidities. The primary endpoint was to assess the factors that are associated with DAPT use. The secondary endpoint was to assess the level of patients’ awareness about their overall anti-platelet therapy. Chi-square and Fischer exact tests were used to compare qualitative variables, and logistic regression was used for multivariable analysis.

Results: A total of 385 patients were enrolled in the study. The factors that are associated with greater DAPT use in comparison to mono anti-platelet therapy were assessed. Patients with
acute coronary syndrome were significantly more on DAPT rather than monotherapy (84.4 percent versus 33.9 percent; P less than 0.001, odds ratio [OR] equals 2.786). Similar results were associated with diabetes mellitus (44.8 percent versus 26.6; P equals 0.001, OR equals 1.835), and heart failure (8.3 percent versus 1 percent; P equals 0.001, OR 7.817). With respect to interventional procedures, it was significant for both PCI (75.8 percent versus 42.8 percent; P less than 0.001, OR equals 2.786) and CABG (28.6 percent versus 15 percent; P equals 0.01, OR equals 1.027). With respect to medications, the use of beta blockers, non-dihydropyridine calcium channel blockers, ACE inhibitors, statins, and proton pump inhibitors (PPIs) was significantly greater in the DAPT group. For the secondary outcome measure, 29.4 percent only of the total patients knew the adverse events associated with their therapy, and 6 percent only were aware about the drug interactions. Moreover, only 30.4 percent of the total patients were aware about their therapy status with respect to any kind of surgery.

**Conclusion:** The use of dual anti-platelet therapy among Lebanese patients was linked mainly to acute coronary syndrome, diabetes mellitus, and heart failure, as well as interventional cardiac procedures. Furthermore, there are great gaps in the patients’ level of awareness with respect to their therapies. Therefore, pharmacists should have further greater role in educating their patients about their medical cardiac and metabolic disorders that may affect their need to an anti-platelet therapy; as well as counsel them about use and safety of those medications.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-070

Poster Title: Screening a large patient cohort for HLA-B*15:02 identifies non-Asian patients at risk of carbamazepine-induced Stevens-Johnson syndrome during carbamazepine therapy

Primary Author: Leah LaRue, Millennium Health; Email: leah.larue@millenniumhealth.com

Additional Author(s):
Andria Del Tredici
Tanya Moreno
Eric Dawson

Purpose: The HLA-B*15:02 allele of the HLA-B gene (human leukocyte antigen-type B) is strongly associated with severe skin hypersensitivity reactions such as Stevens-Johnson syndrome and toxic epidermal necrolysis in patients treated with carbamazepine. FDA approved carbamazepine labeling recommends HLA-B*15:02 screening prior to carbamazepine therapy in patients of Asian ancestry. The Centers for Medicare and Medicaid Services restrict payment for HLA-B*15:02 testing to individuals being considered for carbamazepine therapy who are of Asian or Oceania ancestry. In contrast, Canadian guidelines recommend screening for HLA-B*15:02 in patients of any ethnicity. In this study, we aimed to evaluate the prevalence of HLA-B*15:02 in a large cohort of patients of unrestricted ethnicity.

Methods: A retrospective database analysis was conducted utilizing data from patients (number = 123,939 patients) receiving pharmacogenetic testing from a specialty clinical laboratory. The pharmacogenetic test was ordered by healthcare providers using a requisition form in which healthcare providers identified patient ethnicity from the following categories: African-American, Asian, Caucasian, Hispanic, or Other. Patients who did not belong to one of these ethnic groups or those who had more than one ethnicity selected were identified as ‘Other’. Patients without ethnicity information were placed in the ‘Not Reported’ category. Research protocol was reviewed and approved by Aspire Institutional Review Board (IRB).

Results: Out of almost 125,000 patients tested, 158 were found to be positive for HLA-B*15:02 (0.12 percent), based on the high-throughput tagging single nucleotide polymorphism assay. The observed HLA-B*15:02 frequency (0.12 percent) is lower than has been observed in Asian ethnicities, and higher than in Caucasian and African groups. Out of the 158 positive patients, only 41 percent (number = 65) had physician-reported ethnicity information. Surprisingly, of

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
these, only 43 percent (number = 28) were Asian. The remaining were reported as African Americans (22 percent, number = 14), Caucasians (17 percent, number = 11), Hispanics (3 percent, number = 2), and ‘Other’ ethnicity (15 percent, number = 10).

**Conclusion:** The observed frequency of HLA-B*15:02 in a large United States’ cohort is consistent with the multiethnic nature of the United States’ population. Unexpectedly, patients positive for HLA-B*15:02 included non-Asian patients as identified by their physician. These results are consistent with the recent report of a Spanish patient who developed Stevens-Johnson syndrome in response to carbamazepine therapy. In the ethnically diverse United States’ population, screening patients for HLA-B*15:02 based on observed or self-reported Asian ancestry may be insufficient to identify patients at risk of developing carbamazepine induced Stevens Johnson syndrome. [Note: This abstract has not been presented or published previously. However, certain data elements have been included in a poster presented at the Annual Clinical Genetics Meeting of the American College of Medical Genetics on March 23, 2016.]

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-071

Poster Title: Impact of cascade reporting on fluoroquinolone prescribing

Primary Author: Nancy Le, N/A; Email: n_le5@u.pacific.edu

Additional Author(s):
Olga DeTorres
Marissa Fajardo

Purpose: Fluoroquinolones are routinely prescribed antimicrobials at O’Connor Hospital. However, in 2016 the FDA recommended that fluoroquinolones be reserved rather than used as first-line treatment for uncomplicated infections due to risk of serious side effects. One measure to reduce inappropriate use of fluoroquinolones and improve patient outcomes was selective susceptibility (cascade) reporting. Only susceptibilities to narrow spectrum agents are reported, thereby reserving the broader spectrum antimicrobials for second-line therapy. The objectives of this study were to evaluate the impact of cascade reporting on antimicrobial prescribing and determine if cascade reporting decreased the rate of inappropriate fluoroquinolone prescribing.

Methods: Data was collected retrospectively from the electronic health records of patients who received a systemic fluoroquinolone for any indication prior to implementing cascade reporting (March 2016) and after (March 2017) implementation. A medication use evaluation (MUE) on the fluoroquinolones was performed. Data collected included indication for use, culture results, duration of therapy, if antimicrobial therapy was de-escalated based on culture results, as well as treatment failures.

Results: The MUE found that the number of patients who received fluoroquinolones did not change significantly after the implementing of cascade reporting. However, the rate of antibiotic de-escalation improved (40.4% of patients were taken off of quinolone antibiotics when results became available compared with 35.1% prior to cascade reporting). Seven percent fewer patients were discharged on a fluoroquinolone after implementing cascade reporting. The prevalence of quinolone-resistant infections decreased by 28.7%.

Conclusion: While it did not decrease the use of fluoroquinolones as empiric therapy, cascade reporting did impact culture-driven antimicrobial therapy, and increased the use of narrow

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
spectrum antimicrobials once culture and sensitivity results became available. It also decreased the number of patients discharged on a fluoroquinolones and the rate of fluoroquinolone-resistance in the community.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-072

Poster Title: Impact of large group presentation versus small group facilitated discussion on literature evaluation performance and student confidence

Primary Author: Wesley Lindsey, Auburn University; Email: wtl0001@auburn.edu

Additional Author (s): Daniel Surry

Purpose: For student pharmacists to develop into lifelong learners and competent practitioners, continued exercise and refinement of literature evaluation skills must be introduced early in the curriculum and carried throughout the professional program. The objective of this project is to assess the impact of small group facilitated discussion versus large group presentations on student performance and confidence regarding literature evaluation skills in a simulation lab setting.

Methods: This project was considered exempt by the Auburn University IRB. In fall of 2015, students prepared a discussion comparing and contrasting two similar clinical trials as a team of approximately 8 members. A single team member was then selected to present the team’s findings to the entire lab section of four teams and a panel of 3 to 5 faculty and resident evaluators. Team assessments were then performed based on the presentation and resulting question and answer session. In fall 2016 students prepared a discussion as a team of approximately 8 members comparing and contrasting two clinical trials and the entire team presented to a single facilitator in a small group round robin format. Team assessments were performed on the presentation and resulting question and answer sessions with a similar rubric to 2015. A pre and post lab survey consisting of 10 questions assessed the student’s confidence and ability in literature evaluation skills prior to and after the lab sessions. Pre-surveys were completed in Canvas and students were provided assignment credit for completing. Post-surveys were completed in Qualtrics and were voluntary and anonymous. Impact of this lab format change was also assessed in student performance on a team based journal club presented one week later in the simulation lab setting.

Results: There are no striking differences in the student responses between the two years on the pre-test assessment. There is a notable shift in the post-lab assessments. In 2015 questions 1-7 which assessed student ability and self-confidence there was a notable drop of 4
percent to 15 percent depending on the question. This was reflected on in 2015 stating that students may have initially been overconfident or not really understood the process of literature evaluation and the depth of analysis required. In 2016 it can be noted that for questions 1 and 2 there was still a decrease of 4 percent, but the decline was less dramatic than the 15 percent decline the previous year. Of significance questions 3 through 7 actually saw improvement in students’ confidence and ability to analyze and apply primary literature. Many of these domains saw a 20 to 30 percent improvement compared to decreases of 5 to 8 percent the prior year. Student performance was also assessed on the journal club skills lab presentation conducted the subsequent week in both years. Student teams scored an average of 88 percent on the journal club in 2015 while student teams scored an average of 93.4 percent in 2016.

**Conclusion:** Small group facilitated discussion improved literature evaluation skills and confidence compared to large group presentation and question and answer sessions for third year pharmacy students. Student performance was also improved on subsequent journal club presentations after the small group facilitation session the prior week.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-073

**Poster Title:** Implementation of active learning in a literature evaluation module for Japanese pharmacy students during a hospital rotation.

**Primary Author:** Shinichi Masuda, Toho University Medical Center Ohashi Hospital; **Email:** shinichimasuda0110@gmail.com

**Additional Author(s):**
Masahiro Sakai
Kazuko Kobayashi
Sumiko Hiura
Hideki Kobayashi

**Purpose:** The purpose of this study was to propose, implement and evaluate a new Japanese Pharmacy School outcome-based curriculum on literature evaluation over two years. Japanese pharmacy students do not have enough experience using English-based pharmacy literature. Both Japanese and English literature is indispensable for using accurate and up to date information as a pharmacist. Adapting and evaluating both literatures is required during the clinical rotations. We conducted an active learning strategy to assess English language literature and build literature evaluation skills for pharmacy students in a Japanese teaching hospital.

**Methods:** Fifty three Japanese pharmacy students participated in the active learning exercise during their 11 week hospital rotations in Toho Medical Center Ohashi Hospital between April 2016 and March 2017. Following that exercise, students were tested for comprehension and impressions of the experience. Students were first given lectures on literature evaluation skills of randomized controlled trials. Second, students were asked to assess a randomized controlled trial (EMPA-REG study) in small groups of four to five students. Following a discussion of pearls from the study by a pharmacist preceptor, students were asked to consider how to adapt this literature to simulated cases. The results and reasons of their adoptions were announced and discussed by the groups. Following the education program, students were surveyed in a questionnaire format with a rating scale (very useful to poor useful or very intelligible to poor intelligible) regarding teaching methods, handouts adaption literature evaluation results to simulated cases and tested for understanding on the following items;
PICO, reading order, relative risk, relative risk reduction, absolute risk reduction and number needed to treat. Students were also able to freely comment about the experience.

**Results:** The questionnaire collection was 94.3% (50/53) of students. Ninety-two percent (46/50) said that literature evaluation skills are very useful or useful to adapt results to actual patients during clinical rotations. The rate of comprehension on relative risk reduction and absolute risk reduction was 84% (42/50), but the rates of the other evaluated items was 90% or more. The problems identified were primarily related to English as a second language and the difficulty finding words for clinical evaluations..

**Conclusion:** Active learning strategy is an effective method for non-English pharmacy students to build literature evaluation skills.
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-074

**Poster Title:** Optimization of the use of prothrombin complex concentrates across a community hospital system

**Primary Author:** Jeff McCarthy, Southcoast Hospital Group; Email: mccarthyje@southcoast.org

**Additional Author(s):**
Kenneth Eugenio
Virginia Camisa
Michael Marcoux
John Evans

**Purpose:** Increasing use of 4 factor prothrombin complex concentrates (4FPCC, Kcentra) for the reversal of Warfarin and direct acting oral anticoagulants has the potential to significantly impact patient care and cost. Minimizing the use outside of approved indications, or when more cost-effective alternatives are available is paramount. Given the increasing utilization across our system, it became clear that a thorough review was warranted.

**Methods:** We performed a retrospective review of all patients who received 4FPCC from 9/1/2014 through 8/31/2015. We reviewed whether patients met the criteria for major, serious or life threatening bleeding, or emergent surgery/procedure, in accordance with criteria from the International Society for Thrombosis and Hemostasis. Results identified a trend of growing use, and a greater trend of increasing use and cost in patients not meeting the defined criteria, particularly with inpatient use. Through collaboration with the medical staff, we implemented a series of prospective, order level questions, answered during the prescribing process. This system facilitated documentation of criteria for use without delaying the order. The prompts also helped to guide appropriate use of 4FPCC. We also reviewed whether patients with warfarin associated bleeds that received 4FPCC concomitantly received vitamin K 5-10 mg x 1 as per hospital guidelines. Results identified inconsistent compliance with hospital guidelines to administer vitamin K along with 4FPCC in this population. We then developed linked orders for Vitamin K and 4FPCC for warfarin associated bleeds. A retrospective analysis was conducted post-implementation (from 11/1/2016 through 1/31/2017) to analyze the impact of this process change.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** Across our system 47 patients received 49 doses of 4FPCC during the defined period. Overall, 39(79.5%) doses meet criteria for use. The majority of use was in the emergency departments, 34 doses, 30(88.2%) met criteria for use. Throughout the inpatient units, 15 doses were administered and 9(60%) met criteria for use. 4FPCC inpatient use not meeting criteria increased throughout the review, quarter 1=0, quarter 4=5. Cost of 4FPCC in patients not meeting criteria increased quarterly as well, quarter 1=$0, quarter 4=$18,402, total cost in patients not meeting criteria was $34,902. Following implementation of the order level prompts, 4FPCC use throughout the system remained consistent with quarter 4 of our original review, 17 doses during each quarter. Overall, 15/17(88%) doses met criteria during the follow up period compared with 12/17(70%) during quarter 4 of our original review. Inpatient use during the post implementation quarter showed, 6/6 (100%) doses met criteria, compared with 3/7(43%) during quarter 4 of the original review. 41 doses of 4FPCC were given for the reversal of warfarin associated bleeds during our original review, of these 26(63%) received IV vitamin K concomitantly. Post implementation of the linked orders concomitant administration occurred in 11/13(85%) doses.

**Conclusion:** Through order level prompts we were able to contain the growth and expense of 4FPCC by minimizing use in patients who did not meet criteria. In addition, through implementation of an order panel we were able to increase concomitant administration of vitamin K and 4FPCC for warfarin associated bleeds eliminating the need for repeat dosing of 4FPCC during the post-implementation review period.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-075

Poster Title: Catheter-associated urinary tract infection (CA-UTI) prophylaxis after robotic radical prostatectomy (RRP)

Primary Author: Ashley McDonald, University of Minnesota; Email: mcdon786@umn.edu

Additional Author (s):
Nicholas O’Rourke
Whitney Bergquist

Purpose: It is common practice for patients who undergo RRP at our institution to remain with an indwelling urinary catheter for one week to promote bladder anastomotic healing. To reduce CA-UTI, prophylactic antibiotic therapy with ciprofloxacin is a well-accepted practice in these patients. In 2016, the Food and Drug Administration strengthened its warning on the serious side effects associated with fluoroquinolones and suggested utilizing alternative antibiotics for various indications when able. Subsequently, education was provided to our Urology providers about utilizing alternative prophylactic antibiotics. The goal of this investigation was to characterize prophylactic antibiotic use in these patients after our education.

Methods: We conducted a medication use evaluation of prophylactic antibiotics prescribed at the time of hospital dismissal after RRP. Our educational intervention supported an increase in use of sulfamethoxazole/trimethoprim (SMZ-TMP), we investigated the incidence of SMZ-TMP prescribing after this intervention which occurred in August 2016. To allow time for practice change, a surgical list of patients scheduled for RRP between December 2016 and March 2017 was gathered for chart review. The incidence of SMZ-TMP prescribing was determined by dividing the number of patients that were prescribed SMZ-TMP at hospital dismissal by the total number of patients analyzed. For comparison purposes related to SMZ-TMP prescribing, it was assumed that prior to the educational intervention that SMZ-TMP prescribing was less than 5% for this indication. SMZ-TMP was considered to be potentially inappropriate if the patient met one of the following criteria: 1) sulfa allergy; 2) renal impairment defined as creatinine clearance less than 30 mL/min; 3) hyperkalemia defined as potassium greater than 5.2 mmol/L; 4) concomitant use of an angiotensin-converting enzyme inhibitor, angiotensin II receptor antagonist, or aldosterone receptor antagonist; 5) patient history of SMZ-TMP resistant organism. This project was approved by the institutional review board.
**Results:** Of the 60 patients who were identified for chart review, 4 patients were excluded due to treatment antibiotic therapy and 1 patient did not undergo RRP. Therefore, a total of number 55 patients were included in the final analysis. Of these 55 patients, 12 were prescribed SMZ-TMP, 42 patients were prescribed ciprofloxacin, and 1 patient was prescribed an alternative antibiotic. A total of 18 patients were found to be potentially inappropriate candidates for SMZ-TMP and none of these 18 patients were prescribed SMZ-TMP at hospital discharge. A total of 37 patients did not meet our criteria as potentially inappropriate candidates for SMZ-TMP, however only 12 of these 37 patients were prescribed SMZ-TMP at hospital discharge. This left 25 patients who may have been an appropriate candidate for SMZ-TMP but were prescribed ciprofloxacin or an alternative antibiotic at hospital discharge.

**Conclusion:** Although prescribing of SMZ-TMP for CA-UTI prophylaxis after RRP has increased in a safe manner, there is likely greater opportunity to limit fluoroquinolone use and increase prescribing of SMZ-TMP.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-076

Poster Title: Utilizing cost saving strategies for smoking cessation in a county health-system

Primary Author: Jacqueline Milton-Brown, Harris Health System; Email: jacqueline.milton@harrishealth.org

Additional Author (s):
Goldina Erowele
Abdul-Jelil Tagoe

Purpose: The Center of Disease Control and Prevention reports that cigarette smoking is the principal cause of preventable morbidity and mortality in the United States leading to more than 480,000 deaths each year. Varenicline is a partial nicotine agonist that is used in the aid of smoking cessation. As a cost savings initiative the health system solicits a State Tobacco Prevention Program that allows patients to be referred to a Quit-Line which provides nicotine products and education. The purpose of this evaluation is to assess the cost effective and safe use of varenicline for smoking cessation in a county health system.

Methods: A retrospective electronic chart review was conducted on all patients receiving varenicline from January 2015 through January 2016. The report characteristics included the patient’s demographics, failure of smoking cessation methods and aids before initiating varenicline; referral to smoking cessation classes, patient’s current status on the medication, patient’s psychiatric evaluation before and after the initiation of varenicline. Two hundred and thirteen patients were randomly selected using an online randomizing program.

Results: One hundred and thirty-seven patients were reviewed, thirty-nine percent (54/137) were males and sixty-one percent (83/137) were females. The average age of the patients was 53 years of age. Only thirty-one percent (42/137) of patients were referred to a smoking cessation class while sixty-nine percent (95/137) were not. Thirty-seven percent (50/137) of the patients failed a previous smoking cessation aid before using varenicline. Sixty percent (30/50) used nicotine patches, forty percent (20/50) used bupropion, and eighteen percent used nicotine gum (9/50), three percent (4/50) had previously used varenicline and were trying it for a second time. Two percent (1/50) tried acupuncture, two percent (1/50) used buspirone and two percent tried electronic cigarettes. Three percent (3/87) of the patients were on both

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
varenicline and bupropion concurrently. All one hundred and thirty-seven patients had a psychiatric evaluation. Twenty-eight percent (39/137) had a history of depression, fourteen percent (19/137) had anxiety, four percent (6/137) had bipolar disorder, and one percent (2/137) had post-traumatic stress disorder, adjustment disorder, panic disorder and mood disorder respectively. Only one patient had a history of suicidal ideations or attempts. There were no patients who reported suicidal ideations while using varenicline.

**Conclusion:** Varenicline remains the most costly smoking cessation agent on the county health system formulary. The evaluation revealed that only thirty-seven percent of patients used a more cost effective smoking cessation agent prior to varenicline. Merely thirty percent of the patients were referred to a smoking cessation class. It was recommended to add an alert to the electronic health record with the prices of the alternative smoking cessation agents as well as a reminder to refer patients to a smoking cessation class to guide physicians on using the most cost effective agents prior to prescribing varenicline.
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-077

**Poster Title:** Pharmacoconomic impact of pulmonary hypertension in a county hospital system

**Primary Author:** Jacqueline Milton-Brown, Harris Health System; **Email:** jacqueline.milton@harrishealth.org

**Additional Author (s):**
Erika Bergeron
Goldina Erowele

**Purpose:** Pulmonary Arterial Hypertension (PAH) is a devastating pulmonary disease which exhibits increased pulmonary vascular resistance and right ventricular dysfunction. Treatment of PAH can be an economic burden on a county system with existing tight budgetary restraints. Sildenafil is a phosphodiesterase type 5 inhibitor indicated for the treatment of PAH. Sildenafil is on the hospital formulary restricted to cardiology and pulmonary faculty while the other PAH treatments are non-formulary as a cost savings initiative. This review will assess the adherence to the current restrictions and the cost avoidance associated with the standard of care treatment of Pulmonary Arterial Hypertension.

**Methods:** A retrospective electronic chart review was conducted on eighty-one patients receiving agents indicated for the treatment of PAH. An inpatient and outpatient utilization report for sildenafil use from March 2016 through March 2017 was obtained from the internal Information Systems department. A report of patients who received other PAH agents was supplied by the Patient Financial Services department. The report characteristics included the patient’s demographics, indication for use, physician specialty, restricted criteria selected, and concomitant pulmonary hypertension treatment.

**Results:** Eighty-one patients were reviewed, sixty-five percent (53/81) were female and thirty-five percent (28/81) were males. The average age of the patients was 50 years of age. Eighty-eight percent (71/81) had a documented diagnosis of pulmonary arterial hypertension. Nine percent (7/81) had a documented diagnosis of Raynaud’s syndrome. One percent (1/81) of the patients had diagnoses of CHF, pulmonary sarcoidosis or erectile dysfunction respectively. Twenty-one percent (17/81) of the prescribers were cardiologist and twenty-three (19/81) percent were pulmonologist. The remaining prescribers (45/81) were from either of the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
following services, internal medicine, family practice, infectious disease, oncology, rheumatology or emergency medicine. Forty-six percent (33/71) of the PAH patients had a documented consult from either cardiology or pulmonary services and in some cases both. Eighty-eight percent (71/81) of the patients were taking sildenafil for PAH. Twenty-seven percent of the patients were on an endothelin receptor antagonist in addition to sildenafil. Three percent were on a prostacyclin pathway agent, one percent was on a non-prostanoid prostacyclin receptor agonist and three percent were on a guanylate cyclase stimulant. There was an eighty-eight percent compliance with the restriction guidelines.

**Conclusion:** The cost of treatment with sildenafil for the seventy-one PAH patients in the review was less than ten thousand dollars annually. The Patient Financial Service Department recovered nearly 4 million dollars for the non-formulary PAH agents from patient assistant programs. This resourcefulness has not only been an extraordinary cost savings to the health system but it also allows them to provide the best standard of care treatment for their pulmonary hypertension patients.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-078

Poster Title: National survey of pharmacy residencies’ statistical training practices

Primary Author: Cheyenne Newsome, Washington State University College of Pharmacy; Email: cheyenne.newsome@wsu.edu

Additional Author (s):
Keenan Ryan
Preeyaporn Sarangarm
Ludmila Bakhireva

Purpose: The American Society of Health-System Pharmacists (ASHP) requires all residency programs to include a research project in order to receive accreditation. However, a variety of factors limit the success of residency research projects. Residents’ understanding of research methodology and ability to perform statistical analyses are major hindrances. This study addressed two primary goals: 1) to describe the breadth of statistical training across PGY1 Pharmacy Residency Programs and 2) to examine the relationship between the rigor of statistical training and self-reported residency publication rates as well as RPDs confidence in residents’ abilities to become independent investigator after their residency training.

Methods: The University of New Mexico Health Science Center Institutional Review Board approved this study. A 13-item survey was sent to American Society of Health-System Pharmacists (ASHP) PGY1 RPDs and included questions regarding respondents’ institution, program characteristics, type and amount of statistical training offered and desired, as well as performance of statistics, resident project publication rates, and RPDs confidence in residents’ statistical abilities. Descriptive statistics were used in this study with median for non-normally distributed continuous data. Categorical data was compared using Chi-square. Predictors of RPD confidence and self-reported publication rate were analyzed via multivariate logistic regression with only variables with p < 0.05 in the univariate model included in the multivariate analysis.

Results: Of the 1054 RPDs invited to participate in the survey, 202 (19.2%) surveys were completed. The respondents had a diverse mix of how long the program has been established as well as the size of the institution. Nearly half the residency programs were through privately owned institutions. Of the 202 respondents, 77 (38.1%) had at least one PGY2 program

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
associated with the PGY1. Nearly 25% of PGY1 pharmacy residency programs offer no statistical training to their residents. The most common types of training were study design considerations/selecting statistical tests (64.9%), descriptive statistics (59.9%), and database development/data manipulation (46.6%). The majority (60.9%) of RPDs had low confidence in their residents’ abilities to perform their own statistical analysis. After adjusting for significant covariates, residents receiving complex statistical training (OR 6.76; 95%CI 2.7-24.9) and a publication rate >50% (OR 5.63; 95%CI 1.61-19.69) was associated with higher RPD confidence in residents’ abilities to perform statistical analyses. Many of the RPDs identified statistical training topics they would like to incorporate into their residency programs. The most common area was problem based learning 124/202 (61.4%) while least common was advanced statistical techniques (e.g., nonparametric tests, repeated measure analyses, mixed modelling) 78/202 (36.6%).

**Conclusion:** A survey of ASHP PGY1 RPDs revealed that statistical training for residents is limited and many RPDs are not confident in their residents’ abilities to perform statistical analysis of research projects. Moreover, nearly 25% of residency programs do not offer any statistical training for residents. Pharmacy residency programs could explore options to enhance residents’ opportunities to acquiring skills needed to perform statistical manipulations.
Substitution Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-079

Poster Title: Evaluation of the use of bisphosphonates in osteoporosis patients

Primary Author: Sahar Obeid, LIU; Email: 41130091@students.liu.edu.lb

Additional Author(s):
Abed Al-Karim Hazimeh
Diana Malaeb

Purpose: Osteoporosis was defined as a disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. In Lebanon there is a lack of knowledge about this disease and its treatment. Patient education is the cornerstone of improving the quality of life and health in osteoporotic patients. Pharmacists play an important role in providing essential information about the disease treatment. The aim of this study is to evaluate the adherence of osteoporotic patients to the treatment recommendations and detect the possible means of improvements.

Methods: This was a multicenter descriptive study conducted in community pharmacies distributed in different Lebanese geographic areas from January till April 2017. The inclusion criteria included men and women aged 45 years and above with osteoporosis, and receiving oral bisphosphonate drugs. The exclusion patients on IV bisphosphonates or other medications of osteoporosis. Standardized questionnaires were distributed to all patients fulfilling the inclusion criteria to document the awareness about the disease and the medications. The data was filled by trained personnel during a face-to-face interview with the community patients. The outcome was to assess the knowledge and awareness of patients about osteoporosis medications in terms of administration frequency, timing, and safety. Institutional review board approved the study and written informed consent was obtained from all participants. The statistical test was analyzed by the SPSS version 23.0.

Results: From a total of 300 patients who were screened for possible enrollment in the study, 198 patients had osteoporosis and were included. About the assessment and awareness of medications, the collected data showing that the highest percentages of patients were noncompliant with bisphosphonates (46.7%), skip doses (46%) and unaware the side effects of drugs (52%). In addition, about the method of administration, (43%) of the patients take the
drug after meals, (58.3%) take the drug with other medications and (58.7%) take the drug while the resident is lying down.

Conclusion: The adherence to use of osteoporosis medications was not met. The need for pharmacist counseling in addition to physician is important to prevent the misuse of bisphosphonate drugs and their side effects. Pharmacists tasks aren’t only limited to the practice of medication dispensing but it includes various responsibilities as improving patient awareness about the disease and drugs. This study supports the fact that pharmacist should work in a collaborative manner with other health care professional for the sake of patient care.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-080

Poster Title: Psychotropic medication side effects - training program and feedback

Primary Author: Bernie Olin, Auburn University Harrison School of Pharmacy; Email: olinber@auburn.edu

Additional Author(s):
Wesley Lindsey

Purpose: Drug information centers have numerous traditional roles but, many are also involved in nontraditional activities. This may be more true for academic drug information centers due to a potentially wider focus of activity and opportunity. This report describes a medication safety activity that touches on several functions/expectations of an academic drug information center, including providing information, contributing to a continuing education mission, expanding outreach for a land-grant university, community service and educating the lay public and servants in safe medication use.

Methods: The Institutional Review Board approved this study as Exempt. A regional youth development center (YDC) is a multi-county program that provides a range of services from introductory to intensive care of troubled youth with and without mental illness. Our Continuing Education program is provided every other month to the YDC employees that care for these at-risk youth; medication safety of psychotropic drugs is mandatory annual training, 2.5 hours credit for the course. The focus of the training is psychotropic medication indications, adverse effects, drug interactions, desired outcomes, and mitigation of adverse drug events. Typically three P4 student pharmacists present each of the three topics of Antipsychotics, Antidepressants and ADHD medications; a fourth presentation is a wrap-up/summary in the form of a Jeopardy-like game. The students are always different but are given consistent coaching. This training allows the YDC employees to monitor the children for any adverse drug events. The employees are the primary care givers for many of the children and the first line observer of the efficacy and safety of the medications used. It is primarily a lay audience of team leaders, residential specialists, teachers, foster parents, guards, social workers, counselors, nurses and psychologists. At the end of the session, all attendees are requested to complete an anonymous evaluation. The results of these evaluations for the last two years are presented.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** The evaluation survey consists of six questions asking about the seminar management, quality of topics and presenters and the value of the seminar to themselves and others. Assessment is based the respondents agreement based on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). Over the two years of data gathering, 2015 (n=90) and 2016 (n=94), evaluations have been very consistent and very high. Using 18 students in each of the 2 years, scores ranged from 4.4 to 5 (average 4.88) for 2015. Scores ranged from 4.4 to 5 (average 4.80) for 2016.

**Conclusion:** To accomplish several expectations of service for an academic drug information center a training program was offered for the staff of a specialized juvenile care center focusing on recognition and mitigation of psychotropic medication adverse events. A consistently well received program was developed using a rotating schedule of clerkship students.
**Submission Category:** Drug Information / Drug Use Evaluation

**Session-Board Number:** 4-081

**Poster Title:** Comparison of potassium values before and after patiromer initiation among patients receiving chronic hemodialysis in the United States

**Primary Author:** Christopher Rowan, COHRDATA, LLC; **Email:** crowan@cohrdata.com

**Additional Author (s):**
Csaba Kovesdy
Charles Du Mond
Nina Oestreicher
Wolfgang Winkelmayer

**Purpose:** In December 2015, the U.S. Food and Drug Administration approved patiromer for the treatment of hyperkalemia. We studied potassium concentration trajectories in hemodialysis patients who newly initiated patiromer in real world practice.

**Methods:** In a retrospective observational study, we identified patients receiving hemodialysis at a large U.S. dialysis provider who initiated patiromer between 12/21/2015 and 9/30/2016. Potassium values (mEq/L) were summarized in 6 sequential 30-day periods, 3 before (baseline [BL]) and 3 after (follow-up [FU]) patiromer initiation. Days 91 to 61, Days 60 to 31, and Days 30 to 1 before patiromer initiation represented BL3, BL2, and BL1 periods, respectively. Days 1 to 30, Days 31 to 60, and Days 61 to 91 post-patiromer corresponded with FU1, FU2, and FU3 periods, respectively. We used summary statistics to describe potassium values and calculated the percentage of patients with potassium greater than or equal to 6.0 mEq/L in each BL and FU period. Change in potassium before vs. after patiromer initiation was assessed using the last potassium value prior to patiromer initiation (BL1), to which the last potassium value in each of the three FU periods was compared. Change in potassium (before vs. after patiromer initiation) was analyzed using paired t-tests and McNemar’s tests to assess changes in the percentage of patients with potassium values greater than or equal to 6.0 mEq/L.

**Results:** Of 403 patients studied, mean age was 59 years, 56 percent were men, 67 percent were White/Hispanic, and 18 percent were Black. Before patiromer initiation, mean (standard deviation) potassium values were 5.69 (0.70), 5.72 (0.68), and 5.83 (0.75) mEq/L during BL3, BL2, and BL1 periods, respectively. After patiromer initiation, values were 5.51 (0.75), 5.45 (0.72), and 5.45 (0.75) mEq/L during FU1, FU2, and FU3 periods, respectively. Compared with
BL1, mean potassium values decreased by 0.48, 0.51, and 0.55 mEq/L in FU1, FU2, and FU3, respectively (all p less than 0.001). The percentages of patients with potassium values greater than or equal to 6.0 mEq/L before patiromer initiation were 34.3 percent, 35.4 percent, and 44.5 percent (BL3, BL2, and BL1, respectively) and decreased after patiromer initiation to 26.2 percent in FU1, 23.5 percent in FU2, and 24.5 percent in FU3. The absolute percent reductions (vs. BL1) of patients with potassium values greater than or equal to 6.0 mEq/L were 26 percent for FU1, 28 percent for FU2, and 30 percent for FU3 (all p less than 0.001).

**Conclusion:** Statistically significant reductions in mean potassium concentrations and the percentage of patients with potassium values greater than or equal to 6.0 mEq/L were observed in hemodialysis patients initiating patiromer in this typical practice setting. Given the limitations of retrospective research, these findings merit additional investigation using prospective designs and longer follow-up.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-082

Poster Title: Adherence to renal dosing adjustment guidelines in chronic kidney disease inpatients at two hospitals in Beirut, Lebanon

Primary Author: Rayan Saad, Lebanese International University; Email: rayane.js.20@gmail.com

Additional Author(s):
Sara Katibi
Zeinab Haidar
Bahia Chahine

Purpose: Most chronic kidney disease (CKD) patients admitted to hospitals suffer from different co-morbid conditions that require medical therapy. Several drugs, however, are metabolized or excreted through kidneys and therefore require dosing adjustment in these patients to avoid toxicities or diminished efficacy of drugs, and thus avoid an increased disease burden on patient and society. With the availability of dosing guidelines for the CKD patient population, this study aims at assessing whether appropriate dosage adjustments were made in hospitalized patients with renal impairment.

Methods: A two-centered descriptive study was conducted at Rafik Hariri University Hospital (RHUH) and Al-Zahraa University Hospital in Beirut after receiving approval from the institutional review board of each. 2138 CKD patients admitted between January and December 2016 were screened and only patients receiving drugs that require adjustment were included in the study. 261 adult patients, 148 males and 113 females, with renal impairment were included. Individual patient data including age, sex, serum creatinine, and prescribed medications that need dose adjustment were obtained from computerized patient records. A total of 1073 prescriptions was attained which included angiotensin-converting enzyme inhibitors, beta blockers, diuretics, antivirals, aminoglycosides, carbapenems, cephalosporins, penicillins, fluoroquinolones, other antibiotics, lipid-lowering agents, and miscellaneous drugs requiring renal dosing adjustment. The glomerular filtration rate was estimated from serum creatinine (SCR) using the Cockcroft Gault (CG) equation and dose appropriateness was determined by comparing practice with the guidelines “Drug Dosing Adjustments in Patients with Chronic Kidney Disease” and “Renal Dosage Adjustment Guidelines for Antimicrobials” published by the American Academy of Family Physicians and Nebraska Medicine, respectively.
Data were then summarized in tables and graphs, and the presence or absence of correct dose adjustments of drugs, stratified according to drug class and different patient and hospital characteristics, was analyzed using frequency tables and crosstabs with Chi-square test. Statistical significance was set at P-value of less than 0.05.

**Results:** Among the 1073 medication orders, 396 (37%) were adjusted adequately, 555 (52%) orders were adjusted but inadequately, and 122 (11%) were not adjusted at all. With respect to classes, Beta blockers where the least to be dosed adequately with only 14% of all orders within the class being adequate, whereas prescriptions of lipid-lowering agents were 65% adequately dosed, the highest percentage within a class compared to other classes studied. Rates of adequately adjusted doses within antibiotic classes ranged between 19% for Penicillins and 63% for Fluoroquinolones, and among doses which are not adequate, percentages of adjustments performed inadequately are higher than those of non-adjustment for all antibiotic classes.

**Conclusion:** Our study confirms that physicians are not practicing appropriate renal dosing adjustments in chronic kidney disease inpatients, which may have catastrophic effects on this patient population. This highlights the importance of the clinical pharmacist role in decreasing the rates of dosing errors and improving renal impairment patients’ care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-083

Poster Title: Usage of palbociclib among patients with hormone receptor-positive metastatic breast cancer in a large tertiary care hospital in the United Arab Emirates

Primary Author: Lina Wahba, Tawam Hospital; Email: lwaeba@seha.ae

Additional Author (s):
Hassan Jaafar
Khaled Qawasmeh
Pawan Kumar
Mohammed Jaloudi

Purpose: Palbociclib is an inhibitor of Cyclin-dependent kinases 4 and 6 (CDK4/6). It has been approved as a first line therapy in hormone-receptor positive (HR+) and human epidermal receptor-negative (HER2) metastatic breast cancer (MBC) manifesting significant improvement in progression free survival (PFS). In addition, palbociclib combined with fulvestrant, was recently approved in patients who have progressed on endocrine therapy. A high incidence of hematological adverse events has consistently been observed with palbociclib in clinical trials. The aim of this study is to evaluate the use of palbociclib, as well as, its safety and tolerability in our tertiary care hospital.

Methods: A retrospective observational chart review for all breast cancer patients receiving palbociclib was performed in the study period from June 2015 to April 2016. This study was approved by the institutional review board. Electronic medical record was used to collect patient demographics, hormone (ER/PR) and HER2 receptor status, number of prior lines of endocrine therapy and chemotherapy, duration of treatment with palbociclib, grade of neutropenia and thrombocytopenia at day 28 of palbociclib treatment, and incidence of febrile neutropenia. Descriptive statistics were used as appropriate.

Results: The medical chart of 45 patients were reviewed. As per the inclusion criteria, all patients were females with MBC. Median age was 56 years (range 33-79). Forty-four cases had HR+/HER2- MBC, and only one cases had HR+/HER+ MBC. The majority of patients (26) had palbociclib combined with fulvestrant, 13 patients had it combined with letrozole, and 6 patients had it combined with exemestane. Thirty patients (67%) had received prior endocrine therapy and 26 (58%) patients had received prior chemotherapy in the metastatic setting.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Median duration of palbociclib treatment was 5-months. At initial response assessment, thirty patients (67%) had clinical benefit (stable disease or partial response), eleven patients (24%) had progressive disease (2 died because of disease progression), and two patients lost follow up. Two patients discontinued treatment due to adverse reaction before disease assessment. Palbociclib was well tolerated in the majority of cases. Nevertheless, 26 patients (60%) experienced any grade neutropenia, and out of them, 3 patients (7%) had grade-4 neutropenia. Three patients (7%) experienced febrile neutropenia. Eight patients (17%) had any grade thrombocytopenia, and 2 out of them had grade-4 thrombocytopenia. Two patients had bone marrow metastasis resulting in a higher risk of neutropenia and thrombocytopenia.

**Conclusion:** In our real-world experience palbociclib was found to be effective in the management of hormone positive MBC. Neutropenia and thrombocytopenia were common in our population. Grade -3 neutropenia occurred in 31% of patients receiving palbociclib, however, it was asymptomatic in the majority of patients. Monitoring of complete blood counts and palbociclib dose adjustment can help to improve tolerability.
Submission Category: Drug Information / Drug Use Evaluation

Session-Board Number: 4-084

Poster Title: E-Learning for optimizing professional competency training in drug information

Primary Author: Aiwen Wang, Singapore General Hospital; Email: wang.ai.wen@sgh.com.sg

Additional Author(s): Shyamala Narayanaswamy

Purpose: The provision of drug information (DI) is a core professional responsibility of all pharmacists. Over the years, due to doubled volume of trainees, providing adequate quality experiential placements in DI became more challenging. Therefore, online-based e-learning was suggested to improve access for training. However, the majority of e-learning resources available in 2011 were limited to passive learning modalities, which focused on knowledge, rather than critical thinking and evaluation skills. To overcome these challenges, a novel online program was developed to optimize training, to equip young practitioners with fundamental competencies, and to improve their readiness for inter-professional clinical practice.

Methods: Following the American Society of Health-System Pharmacists guidelines and Singapore Pharmacy Council (SPC) competency standards, an online program with lectures and case-based simulation exercises was implemented in 2012. The design was a formative instruction for pharmacist-trainees to develop a systematic approach to provision of DI. Majority of trainees require demonstrable DI competencies before eventually obtaining pharmacist licensure. Core DI competencies taught during pre-registration training would prepare, and empower them for training rotations at different pharmacy practice settings (e.g. acute care, ambulatory care, and community care settings). The program was focused on six major categories of enquiries: availability and identification, parenteral therapy administration and compatibility, drug use in pregnancy and lactation, drug interactions, adverse drug reactions, and drug dosing. Pedagogy elements were incorporated to facilitate active self-directed learning (e.g. balance interactivity with cognitive load, automated rich feedback and guidance, tiered learning design, and problem-based learning). Following a very successful 2012-2015 pilot in Singapore General Hospital, the program was expanded in 2016 to pharmacist-trainees across the SingHealth health-systems cluster (comprising three tertiary hospitals, and two specialized ambulatory centers). The impact of the program was measured using Kirkpatrick’s model evaluation of educational outcomes. Data was extracted from surveys and interviews with pharmacist trainees and key training faculty members; this was done

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
immediately after the program (Survey 1) and 6 months into the trainees’ clinical practice settings (Survey 2).

**Results:** Over the five-year study period, a total of 205 trainees completed the online program. Majority (n=143) were fresh graduates from the local pharmacy undergraduate degree program. The response rate for Survey1 was 80% (n=114). Excellent ratings in trainee satisfaction (over 95% of respondents rated “meets” or “exceeds” expectations for all twelve domains) were reported. Trainees gave feedback of improved self-efficacy. Empowered with the acquired knowledge and skills, trainees were more confident when encountering DI requests, and stated they would incorporate learning in future practice.

Survey 2 was conducted in 2016. Of the 52 eligible trainees, the response rate was 94%. Gains in confidence were seen across all six major categories of DI requests. Majority of trainees (80-100%) felt that the online programme was “useful” or “very useful” in achieving the 21 competencies for drug information set by SPC. They also reported that the programme enabled them to be more independent in clinical practice.

Feedback from faculty in clinical attachment sites found that the online programme was useful for training. They supported the continuation of this program for all future trainees.

**Conclusion:** A blended learning approach, with a combination of e-learning for early self-directed learning at orientation, combined with hands-on-skills-based training, would be the direction for modern healthcare training of early practitioners. We have shown that optimized e-learning programs will increase the competency and confidence of early pharmacy practitioners. We expect adoption of good DI practices and evidence-based-medicine will improve patient care. Use of online platforms also extended the reach of expertise for standardization of competency training. In 2017, our program was further expanded at a national level to all final-year pharmacy undergraduates in Singapore, and will reach over 200 students annually.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Emergency Medicine

Session-Board Number: 4-085

Poster Title: Impact of clinical pharmacist in Emergency department of an academic hospital in Saudi Arabia

Primary Author: Waad Alkathiri, KSUMC; Email: waad-alkathiri@hotmail.com

Additional Author(s):
Hossam Hassan

Purpose: To assess the need of clinical pharmacy service in the emergency department at King Saud University Medical City, Saudi Arabia

Methods: A retrospective one year study conducted between January 1st and December 31, 2017 at Adult Emergency Department of King Saud University Medical City, Riyadh, Saudi Arabia. The documentation of Emergency Medicine clinical pharmacist interventions was extracted from Esihi database. Including the period of morning shift (07:30-15:30) from Sunday to Thursday.

Results: A total of 3081 interventions were documented. 359 interventions were dose adjustment, 25 intervention were formulary conversion, 15 interventions were therapeutic duplication, 38 interventions were incomplete prescription, and 24 interventions were unnecessary order. 171 drugs addition were recommended by clinical pharmacist, while 19 drugs were contraindication for the patients case scenario were distinguished by clinical pharmacist. And drug - drug interaction were managed in 10 patient by clinical pharmacist. The clinical pharmacist responded to 518 drug information questions, reconciliations were performed on 251 patients, while 62 patients received their discharge medication counseling by clinical pharmacist. The clinical pharmacist acquired medication history in 221 patient in Emergency department. Participate in 18 case of trauma code, and 24 case of as Cardiopulmonary resuscitation code.

Conclusion: This study shows the important role of clinical pharmacy service in the Emergency department.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Emergency Medicine

Session-Board Number: 4-086

Poster Title: Anaphylactoid orolingual angioedema following alteplase treatment of acute ischemic stroke in a patient being treated with an angiotensin converting enzyme inhibitor

Primary Author: Kevin Brandon, Kenmore Mercy Hospital; Email: kbrandon@chsbuffalo.org

Purpose: Thrombolysis with alteplase post stroke may result in an uncommon yet severe adverse effect of orolingual angioedema. This case presentation illustrates the rare yet recognized adverse effect of orolingual angioedema and to present an additional case that occurred with concomitant angiotensin converting enzyme inhibitor (ACE inhibitor) use in a patient that received alteplase.

The patient is an 85 year-old caucasian female, weighing 57.3 kilograms, presented to the emergency room with weakness and neglect of her right side. The patient had a history of hypertension and being treated by her primary care physician with an ACE inhibitor (lisnopril) daily. Upon arrival to the emergency room her National Institutes of Health (NIH) stroke scale was noted to be 16. A decision was made to do thrombolysis and the patient was administered a 0.9 mg/kg total dose of alteplase which was separated into two administrations. A 5.2 mg bolus (10% total dose) was given over one minute. After the bolus was given, the remainder of the alteplase dose, 46.4 mg, was immediately infused over 1 hour.

She developed an anaphylactoid complication consisting of orolingual angioedema following the completion of the alteplase infusion. Etomidate 20mg IV and midazolam 2mg IV was given and ultimately the patient was intubated with a glide scope. Her blood pressure was somewhat elevated at this time but was able to be stabilized with nicardipine infusion and with a goal mean arterial pressure of 80-110. The orolingual angioedema anaphylactoid reaction was treated with diphenhydramine 50mg IV, famotidine 20mg IV, solumedrol 125mg IV and midazolam 2mg IV. She was continued on a ventilator and was admitted to the intensive care unit. At 8 hours post alteplase administration she was more responsive and alert however she was still plegic on the right side. After a few days in the hospital the patient started Hospice care and eventually passed away due to the complications of the alteplase anaphylactoid reaction and respiratory failure.

Orolingual angioedema is a potentially life-threatening complication of alteplase treatment in stroke patients especially those taking an ACE inhibitor. Therefore, it is necessary to use these agents with caution, learn how to properly identify and treat cases of angioedema, and discontinue use of the offending agent after such incidences occur.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Emergency Medicine

Session-Board Number: 4-087

Poster Title: Design and implementation of an emergency department deep vein thrombosis discharge program

Primary Author: Olga Ginsberg, Saint Peter’s University Hospital; Email: olga.ginsberg@gmail.com

Additional Author(s):
Borislav Stoev
Karen Knipe-Simone
Renee DiMarzio

Purpose: The American College of Chest Physicians highly recommends outpatient treatment of deep vein thrombosis in select patients. Outpatient treatment has been shown to significantly decrease health care costs and may be associated with better outcomes. It has not been associated with an increase in mortality, recurrent VTE, or major bleeding. The advent of novel oral anticoagulants facilitates providing such treatment. Our institution designed and implemented a program by which eligible patients could be selected and treated without being admitted to the hospital, while ensuring appropriate transition of care, including access to necessary medications and physician follow-up.

Methods: Meetings were held between emergency department leadership, clinical pharmacy services, care coordination, and management of outpatient clinics associated with the institution in order to set up a viable plan to select appropriate patients and provide for a smooth transition of care, with timely access to the necessary medications and follow-up appointments. A protocol was developed by this interdisciplinary team, and was submitted for approval to various hospital committees. Following implementation a log of patients treated according to the protocol was kept for review. An analysis was conducted as to the number of patients treated and the treatment received.

Results: A protocol was implemented which identified patients eligible for outpatient treatment, ensured a timely follow-up appointment with a transitions of care clinic for those patients without a primary care physician, administered first doses of appropriate medications in hospital, and provided prescriptions and vouchers for a complimentary month supply to

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
allow ease of access to pharmacological treatment. Rivaroxaban (Xarelto) and apixaban (Eliquis) were the medications chosen to be incorporated into the protocol. As part of the protocol, a pharmacist was consulted to determine appropriateness of the medication regimen prescribed, and to determine if there were any potential drug interactions. During the first three months of implementation this discharge program was utilized for seven patients. Three patients were treated with rivaroxaban and four were treated with apixaban. In five of the cases, the primary care provider was contacted and the patient was instructed to make an appointment with his or her primary care provider. Two patients had an appointment made for them with the transitions of care clinic. Five of the patients were male; two of the patients were female. The age of the patients ranged from twenty-seven to sixty-nine. The median age was sixty-three, the mean age was fifty-six.

**Conclusion:** The protocol created allows for identification and smooth transition of care for DVT patients eligible for outpatient treatment, providing safe and effective therapy with a decrease in health care costs.
Submission Category: Emergency Medicine

Session-Board Number: 4-088

Poster Title: Thrombolytic use in cardiac arrest related to pulmonary embolism: an evaluative study

Primary Author: Katie Hiles, Franciscan Health Indianapolis; Email: katie.hiles@franciscanalliance.org

Additional Author (s):
Aaron Steffenhagen
Sara Damewood

Purpose: A paucity of data continues to exist on the efficacy of thrombolytic therapy in the critical situation of cardiac arrest and relative time-to-treatment benefit. Recently published data in a small retrospective single center study revealed a possible association between early and timely thrombolysis and the achievement of return of spontaneous circulation (ROSC) in the setting of pulseless electrical activity (PEA) cardiac arrest due to confirmed pulmonary embolism (PE). To further elucidate this temporal association, retrospective data from two health systems is presented, with a focus on efficacy and safety.

Methods: Patients across two separate health systems who received thrombolytic therapy (alteplase or tenecteplase) during cardiac arrest for confirmed or suspected PE over a three year period (4/1/2014-3/31/17) were included. Patient characteristics collected included age, weight, previous or concomitant disease, location of arrest, initial and subsequent cardiac rhythms, pulmonary embolism severity index (PESI) score for cases of confirmed PE, thrombolytic dose administered, and diagnostic laboratory and imaging data. Efficacy was evaluated by achievement of ROSC and survival to discharge relative to time of thrombolytic administration for suspected and confirmed PE cardiac arrest. Safety was evaluated by incidence of bleeding of any severity. This retrospective evaluation was deemed exempt from requiring full institutional review board approval at both centers.

Results: A total of 24 patients met inclusion criteria (23 alteplase, 1 tenecteplase). ROSC was achieved in 33 percent of patients (n equals 8). Thrombolytic therapy was initiated at 18.4 minutes on average from the time of onset of cardiopulmonary resuscitation (CPR) for patients that achieved ROSC, and 43.1 minutes for patients that did not. Survival to discharge occurred in 13 percent (n equals 3) of patients with thrombolytic therapy initiated at an average of 22

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
minutes from time of onset of CPR. Bleeding occurred in 13 percent of patients (n equals 3) with one patient surviving to discharge.

**Conclusion:** A small sample size and variability of factors such as thrombolytic dose make it difficult to determine the true impact of thrombolytic timing on ROSC and survival to discharge. Despite these limitations, the results further support an association of early treatment with attainment of ROSC as previously demonstrated. Bleeding risk is a concern and should be considered in decision-making. Larger, controlled trials are necessary to refine the time window for efficacy, and the patient population that would most likely benefit from thrombolytic therapy during cardiac arrest with suspected or confirmed PE.
Submission Category: Emergency Medicine

Session-Board Number: 4-089

Poster Title: Predictors of delayed medication administration in the emergency department

Primary Author: Alyssa Kaufman, UF Health Jacksonville; Email: alyssa.kaufman@jax.ufl.edu

Additional Author(s):
Patrick Aaronson
June McAdams
Joe Spillane
Mark Schreiber

Purpose: The dynamic workflow and busy nature of the emergency department (ED) creates a challenging environment for timely medication administration. Understanding which factors are associated with medication delays could help provide guidance for future resource allocation and improvement in patient safety and outcomes. This study aims to determine factors that may help predict medication delays in a high-volume emergency department of an academic medical with a level 1 trauma ED.

Methods: This was a retrospective, single-center study of approximately 100,000 scheduled medication orders for patients located in the ED between August 1, 2015 and July 31, 2016. Pediatric ED orders, PRN orders, saline boluses, and active investigational medications were excluded from the study. The primary endpoint assessed was delayed medication administration in the ED. Medications administered to patients greater than 60 minutes from the specified order start-time were considered delayed. Secondary endpoints assessed delayed administration for time-critical medications and evaluated a random sample of 200 delayed orders for documented reasons for delay. A multiple logistic regression model was used to analyze pre-specified variables for association with delayed medication administration. The following pre-specified variables were evaluated: drug class, medication dispensing location, boarded patients in the ED, day and night shift, and medications due for administration during nursing shift change hours.

Results: Out of 97,887 medication orders, 18,305 orders (18.7%) were administered delayed. A total of 42,169 pharmacist-verified orders were identified, and the prevalence of delayed administration was determined to be 29.7%. Medication delays were found to occur in 31% of the orders for patients boarding in the ED compared to 25% of the orders for patients not
boarding (p < 0.0001). Medications were administered delayed 38% of the time when dispensed from the inpatient pharmacy compared to 25% when dispensed from an automated dispensing cabinet located within the ED (p < 0.0001). Orders that were due during nursing shift change hours were administered late 32% of the time compared to 29% for orders that were not due during this time period (p < 0.0001). Specific drug classes were also associated with delays (p < 0.0001), with anti-infective agents having the highest percent delayed at 44%, followed by gastrointestinal agents with 33% administered delayed. Time critical medications were found to be delayed 35% of the time compared to 29% for the non-time critical medications (p < 0.0001). Out of 200 delayed orders assessed, 52% (104 orders) had a documented reason for delay, and the most common documented reason was that the patient was unavailable/in a procedure (24%).

**Conclusion:** This study found several factors to be associated with medication delays in a busy ED environment, which included time critical medications, medications dispensed from the inpatient pharmacy, medication orders for patients boarding in the ED, specific drug classes such as antibiotics, and medications that are due during nursing shift change hours. The results from this study have helped target potential areas for improvement in timely medication administration in the ED.
Submission Category: Emergency Medicine

Session-Board Number: 4-090

Poster Title: Implementation of a pharmacist driven urine culture follow-up service in the emergency department

Primary Author: Elizabeth Legros, Mercy Health St. Rita’s Medical Center; Email: exlegros@mercy.com

Additional Author(s):
Jessica Walles

Purpose: Urinary tract infections are a common infection encountered in the emergency department. Urine cultures are frequently collected regardless of symptoms of a possible urinary tract infection, thereby resulting in unnecessary antibiotic treatment after emergency room discharge. This unnecessary antimicrobial utilization can increase resistance and adverse drug reactions. A pharmacy service was implemented to reduce unnecessary treatment in asymptomatic bacteriuria and decrease overall antimicrobial length of therapy in patients discharged from the emergency department with a positive urine culture.

Methods: The emergency department pharmacists developed a follow-up guideline for patients with positive urine cultures who were discharged from the emergency department. The cultures were reviewed daily by the emergency department pharmacist. The pharmacist reviewed the patient chart for allergies, chief complaint, prior antibiotics prescribed, renal function, culture results, and visits with other providers in the health system. The pharmacist then determined appropriate treatment, if needed, and reviewed all cultures and recommendations with an emergency department physician or mid-level provider. The pharmacist followed-up with patients as necessary and documented in an intervention, a telephone encounter if applicable, and a progress note. All positive urine cultures were retrospectively reviewed prior to service implementation from February 1, 2017 through March 31, 2017 and post-implementation from April 1, 2017 through May 31, 2017. Patients were included if they were not on a current antimicrobial with appropriate susceptibilities to the pathogen identified. Patients were excluded if they were less than fifteen years of age, admitted to an inpatient facility, discharged to a long term care facility, or referred to a specialist. Patients were considered symptomatic if they presented with dysuria, frequent urination, urgency, incontinence, suprapubic pain, costovertebral tenderness, fever, chills, leukocytosis, nausea, vomiting, or altered mental status.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** A chart review included 54 patients pre-implementation and 68 patients post-implementation with urine culture results. Based on patient presentation, nine (16.7 percent) patients pre-implementation were determined to be asymptomatic and were not prescribed antibiotics compared to 26 (38.2 percent) patients post-service implementation. Seventeen (31.5 percent) patients were treated during the pre-implementation period despite no evidence of urinary tract symptoms versus five (7.4 percent) patients post-implementation. Eleven (20.3 percent) patients required a change in prescribed antibiotic secondary to antimicrobial resistance pre-implementation and seventeen (25 percent) post-implementation. The average antimicrobial length of therapy was 7.1 days pre-service implementation and 4.5 days after implementation of the pharmacy follow-up service. Resulting in a reduction in length of antimicrobial therapy of 2.6 days.

**Conclusion:** A pharmacy driven service reviewing emergency department urine cultures reduced unnecessary treatment of asymptomatic bacteriuria and decreased average length of therapy for patients discharged from the emergency department with a positive urine culture.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Emergency Medicine

Session-Board Number: 4-091

Poster Title: Impact of a pharmacist-managed culture review and follow-up process in the emergency department

Primary Author: Brian Maynard, Amita; Email: brian.maynard@amitahealth.org

Additional Author (s):
Branka Milicev

Purpose: The purpose of this study was to assess the impact of a pharmacist-managed culture review and follow-up program in the emergency department (ED) at two community hospitals. As a result of the overuse and inappropriate prescribing of antibiotics, there is increasing antimicrobial resistance in the community. In the ED, physicians are tasked with the challenge of prescribing antibiotics prior to obtaining the finalized culture results. Therefore, empiric treatment needs to cover the likely pathogens while minimizing the collateral damage of resistance and side effects. ED pharmacists are well positioned to change therapy when needed and choose the most appropriate agent.

Methods: A retrospective study was performed to evaluate the impact of a pharmacist-managed culture review and follow-up process in the emergency department at two community hospitals. The pharmacist-managed service was performed five days per week from Sunday through Thursday. The nursing staff was responsible for culture follow-up on the remaining two days of the week. The emergency department pharmacist was responsible for reviewing a report, which identified patients who left the ED with a positive culture. The pharmacist also received telephone calls from the microbiology laboratory regarding Verigene - (R) results for positive blood cultures and rapid strep tests. Adults and pediatric patients were included in the review. The pharmacist determined if the patient was discharged on appropriate therapy. If a change in therapy was required, the physician would be notified and the pharmacist would call the patient and notify him or her of the change in treatment. The pharmacist would then send the new prescription electronically to the patient’s pharmacy of choice. Interventions were documented in the patient’s electronic medical record. ED revisits within 72 hours were recorded as well as hospital admissions within 30 days. Pharmacy interventions that were recorded included the following: antibiotic changed based on culture/sensitivities, discontinuation of unnecessary antibiotics, and calling patients to return to the ED based on positive culture.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: A total of 484 patients, with 487 positive cultures were evaluated in the final analysis over the 6-month period. The majority of cultures were from the urine (~79%), while the remainder were from blood, wound, stool, strep screen, and sputum. Thirteen patients had an ED revisit within 72 hours (~2.7%), 19 patients were admitted within 30 days (3.9%), and 16 patients returned to the ED within 72 hours and were subsequently admitted (3.3%). The pharmacists intervened on 83 patients (~17%) who required a change in antibiotic due to the pathogen being resistant to the empiric therapy. Three patients (0.6%) were called by the pharmacist to return to the ED because of a positive culture result. For ten patients (2.1%), the pharmacist reported the results to either the primary care physician or the long-term care facility where the patient resided. Finally, antibiotics were discontinued in 3 patients (0.6%) based on culture/sensitivity results. Overall, the pharmacist performed an intervention in 99 patients (~20%).

Conclusion: Over a 6-month period, a pharmacist-managed culture follow-up process in the emergency department had a positive impact on patient care. Antimicrobial interventions were performed in approximately one fifth of patients, supporting the opportunity for the expansion of antimicrobial stewardship in the ED.
Submission Category: Emergency Medicine

Session-Board Number: 4-092

Poster Title: An evaluation of emergency medicine pharmacist (EMP) productivity in a community hospital: clinical services, medication reconciliation, and hours of operation

Primary Author: Amanda Melton, Texas Health Resources Heb; Email: Amandamelton@texashealth.org

Additional Author(s):
Nolan Toups
David Damaske
Randy Martin
Susann Land

Purpose: To compare two staffing models for a community hospital EMP program with respect to preventing medication ordering errors as well as improving overall quality of patient care through clinical services and recommendations.

Methods: An EMP program was initiated in late 2013 at the study hospital, a 300-bed non-academic community hospital. During the course of the program, two primary staffing models were utilized. From inception until 2015, two pharmacists per day provided 16 hours of coverage. The staffing model was then changed to include only one pharmacist per day, providing 10 to 11 hours of coverage. Program benefits were quantified using a database developed and maintained by the hospital’s EMPs. For purposes of our study, data was extracted from the EMP database for the time period of January 1, 2014 through December 31, 2016. Data collected included all pharmacist interventions, including medication histories, medication error avoidance, and all other clinical activities documented by the EMPs. The primary outcome of our study was productivity, defined as number of EMP interventions per day. Quality of medication reconciliation, estimated using medication error capture rate, and classification of interventions were also considered in comparing the two groups.

Results: Between January 1, 2014 and December 31, 2016, EMPs documented a total of 15,124 patient encounters, 12,712 medication reconciliations (89.6% of which had at least one medication error), 74,952 medication errors (6.58 average errors per case and 3,286 errors with high risk medications), and 24,014 medications (41,228 possible daily doses) removed. Other clinical encounters documented by the EMPs included pneumonia interventions (821),
congestive heart failure clinic referrals (344), code blue participation (216), and thrombolytic consultation (41), drug information responses (1867), and infectious disease interventions (764). Despite a difference in the number of hours worked, there was no significant difference in productivity or efficacy between staffing models. Mean productivity (interventions per day) was 13.1 and 14.2 for the 16-hour and 10-hour staffing models, respectively. Efficacy (medication error capture rate) was 87% and 91% for the 16-hour and 10-hour staffing models respectively.

**Conclusion:** As demonstrated in previous studies, the inclusion of pharmacists on our emergency medicine team greatly decreased drug errors and improved patient care in a variety of ways. Our study suggests that in our setting, a 10-hour per day EMP staffing model may be more cost effective than a 16-hour staffing model. Additionally, pharmacy departments utilizing medication orders or dispensed doses as their primary productivity metric should account for the beneficial reduction in medication orders and doses when calculating their productivity.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Emergency Medicine

Session-Board Number: 4-093

Poster Title: Retrospective review of emergency medicine pharmacists' impact on Centers for Medicare and Medicaid Services sepsis bundle compliance in the emergency department

Primary Author: Stefanie Reid, Baptist Health Medical Center; Email: stefanie.reid@ucdenver.edu

Additional Author(s):
Cody Null
Courtney Selby
Kyla Gossman
Amber Evans

Purpose: Reduction of sepsis morbidity and mortality has become an international goal with the Surviving Sepsis campaign initiation in 2002. With the Center for Medicare and Medicaid Services (CMS) incentivizing adherence to these guidelines through the SEP-1 bundle hospitals are looking at new and innovative ways to improve sepsis identification and care.

Methods: Real time auditing of potential sepsis patient cases was performed by the dedicated Emergency Room (ER) pharmacist in order to improve adherence to the CMS SEP-1 bundle. The ER pharmacist followed these patients and worked with nursing staff, laboratory staff, and physicians to meet the timed goals using tools in the electronic medical record (eMAR). All interventions were documented in the eMAR by the pharmacist. Patients discharged with DRG codes relevant to sepsis were then reviewed to determine the number of patients who met the bundle or to determine common areas of failure. Patients were excluded if they were transferred from another hospital facility, not septic while in the emergency department, or if they expired or had comfort care measures only ordered within three hours of sepsis presentation.

Results: Sepsis core measure pass rates steadily increased in the emergency department as the ER pharmacist became increasingly involved in tracking sepsis patients and aiding in meeting bundle measures. CMS SEP-1 bundle pass rates increased from 29.1% in November 2016 to 51.3% in February 2017 after four months. Pharmacist involvement increased over the four month study period. For example, in February 2017, there were 16 patients (20%) with documented pharmacist intervention that aided in passing CMS SEP-1 measures. Reasons for

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
failure were assessed to determine areas for improvement. Initial lactate was drawn appropriately in 89% of patients, blood cultures in 86% of patients, and antibiotics in 74% of patients. Fluids were required in 39% of patients, which was passed 65% of the time when it was required. Repeat lactate, when required, was completed appropriately in 80% of patients. Volume assessment was only required one-fourth the time but was a common area for failure of the bundle. When this was required, it was only completed 37% of the time. This was secondary to a lack of hospital-wide plan for addressing the need for repeat volume assessment.

**Conclusion:** Sepsis core measure requirements have been a major area of focus for many hospitals over the last year. Since this is a bundle measure, all requirements must be met in order to pass CMS requirements. This bundle necessitates collaboration between many healthcare members, including phlebotomy, nursing, and physicians. Emergency medicine pharmacists have proven beneficial in successful increases of CMS SEP-1 pass rates of septic patients in the ER. Data evaluation has also identified areas of improvement, which are addressed with various hospital committees in order to create improvement plans.
Submission Category: Emergency Medicine

Session-Board Number: 4-094

Poster Title: ST segment elevation myocardial infarction following administration of tissue plasminogen activator for acute stroke

Primary Author: Frank Rigelsky, Cleveland Clinic Hillcrest Hospital; Email: frigelsk@ccf.org

Additional Author(s):
Matthew Nagar
Julia Kuroski
Melissa Raich

Purpose: This case study will describe a patient who developed ST segment elevation myocardial infarction following administration of tissue plasminogen activator for acute stroke. An 81 year old male (109 kg) presented to the emergency department with the chief complaint of left sided weakness, facial droop, slurred speech, nausea and vomiting. His last known normal neurological status was 60 minutes prior to arrival (1130). His calculated NIHSS score while in the emergency department was 5. The CT head showed an occluded left vertebral artery at its origin. Alteplase was ordered (bolus of 9 mg followed by 81 mg infusion over 60 minutes) and administered after control of his blood pressure with labetalol 10mg IV push at 1257 (Door to needle time 28 minutes). EKG at 1300 showed normal sinus rhythm with left anterior hemiblock, left ventricular hypertrophy with QRS widening and repolarization abnormality. Patient tolerated the alteplase therapy which was completed at 1400. At approximately 1530, the patient complained of heavy severe retrosternal chest discomfort. EKG showed hyperacute T waves in the anterolateral precordial leads and 2 mm of high lateral ST segment elevation in leads 1 and L with reciprocal inferior depression. The hospital’s standardized protocol and procedure for a STEMI was activated. The ICU intensivist ordered a heparin bolus 4400 units: (40 units/kg x 109.1kg) at 1557 followed by an infusion of 2000 units/hour while awaiting arrival of the cardiologist and cath lab team. The patient was transported to the catheterization laboratory for acute coronary intervention at 1620. The patient was found to have an occlusion of the mid left anterior descending artery (LAD) which was recannulated with percutaneous transluminal angioplasty (PTCA) at 1654. Angiography demonstrated high-grade calcified subtotal mid LAD focal lesion, followed by a tubular 80% stenosis in the mid LAD slightly beyond the infarct related lesion. The patient underwent placement of a 2.5 x 16 mm drug-eluting stent (DES) to the distal mid lesion, and placement of a 3.0 x 18 mm DES to the more proximal mid lesion with good angiographic results. TIMI 3 flow

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
was restored at the completion of procedure. During the procedure the patient received heparin 2000 units IV at 1653 based on ACT results of 235. He also received ticagrelor 180 mg at 1751. Patient returned to the ICU at 1805. The patient passed his bedside swallow screen after the procedure, and was alert and oriented to person, place, and time with no neurological deficits noted. He did develop a hematoma around the femoral sheath, thus the heparin infusion was stopped at 2146. No additional complications from the hematoma were described. The following day he had a NIHSS of 1 with a swallow evaluation that demonstrated very mild weakness with laryngeal excursion. The patient exhibited no speech or language deficits. The repeat CT scan showed no evidence of an acute infarct or other acute parenchymal process and no evidence of acute intracranial hemorrhage. On hospital day three, the patient developed non-sustained ventricular tachycardia at which time amiodarone was initiated. The patient also demonstrated symptoms of acute congestive heart failure on exam with an echocardiogram revealed an ejection fraction of 40%. The patient was discharged home with home health care on hospital day five with no further complications on aspirin 81mg daily; ticagrelor 90 mg twice daily; atorvastatin 80 mg daily; carvedilol 12.5 mg twice daily; valsartan 40 mg daily; spironolactone 25 mg daily, and amiodarone 200 mg daily.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Emergency Medicine

Session-Board Number: 4-095

Poster Title: Cost and labor savings from a formula based systematic reduction in ED drug inventory

Primary Author: Richard Thomas, Intermountain Medical Center; Email: richard.thomas@immail.org

Additional Author(s):
Jake Critchlow
Amie Quinones
Jeremy Bair
Kyle Gordon

Purpose: The resources required to maintain an adequate stock of medications in the emergency department (ED) is in part directly proportional to the total drug inventory. As individual and total drug inventories decrease, so do the needed resources, both in terms of staff time and inventory costs. The purpose of this project was to reduce the total drug inventory of a large urban emergency department (~90,000 visits/year), especially the inventory of controlled substances by using a systematic approach that would apply to all drugs instead of depending on the various opinions of the individual pharmacy personnel responsible for the system.

Methods: In Phase 1 of this project, the ED drug inventory in 5 automated dispensing cabinets (ADC’s) was entered on an Excel spreadsheet along with the unit price of each drug. A total inventory was calculated along with the total value of each medication based on the maximum quantity to be stocked. This provided the baseline inventory and inventory value. The ED pharmacy technician also measured the average time to conduct his monthly ADC inspections. All drugs were first evaluated for their appropriateness in the ED and removed if no strong reason could be found to stock them. Then the maximum drug inventory was readjusted based on the following formula: 3 X “Average Daily Use” or “Peak Daily Use” whichever was larger. This formula proved to be too extreme in its reduction of certain drugs causing several inventory shortages prior to the daily ADC restocking. In Phase 2, a new method was subsequently developed to avoid this zero inventory situation. All drugs were categorized as either as “critical” or “non-critical” and either as “low use” (< 2 dosage units/day) and “high use” (2 units/day). Using both the average daily use and peak daily use values for each drug,
new formulas were created and the par and maximum quantity values were recalculated. A new minimum quantity was also set for each drug. Pharmacy technician time was also recalculated.

Results: In Phase 1, the total maximum inventory (TMI) was reduced from 9,370 doses to 2,677 doses, a 74% reduction. The total inventory value (TIV) was reduced from $27,829 to $9,152, a 68% reduction. The actual number of doses removed from the ADC’s was somewhat less, 8,146 of which 1,201 doses were controlled substances and 6,945 doses were non-controlled drugs, valued at $24,946. During Phase 2, the TMI increased to 4,054 doses from 2,677 in Phase 1, a decrease of 57% from the baseline inventory but an increase of 17% from the extreme reductions in Phase 1. The TIV from the second phase was $14,681, a reduction from baseline of 47% and a 21% increase over the reduction in Phase 1. There was a subjective but noticeable difference in the time that it took to restock the ED ADC’s which could not be accurately measured because of difficulties in quantifying the time. One measure of reduced pharmacy labor time was the time for monthly ADC inspections. The baseline time for these inspections prior to Phase 1 was 485 minutes a month. After Phase 1 they took 375 minutes or a reduction of 23% or almost 2 hours per month.

Conclusion: Medications stocked and used in an ED have the potential for significant inventory “creep” over time. When this increase is subjectively decided by multiple pharmacy staff members the results can be overstocking, ADC’s stocked to maximum capacity, an increase in expired drugs and prolonged monthly ADC inspections. By applying a systematic approach to the inventory with PAR’s and minimum and maximum stocking levels based on standardized formulas using such measures as average daily use and maximum use and adjusting the levels for true emergency drugs, the drug inventory can be controlled, inventory costs can be reduced and labor costs decreased.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Informatics / Technology / Automation

Session-Board Number: 4-096

Poster Title: Establishing a beyond use date for compounded haloperidol oral suspension prepared from tablets using a novel automated wet-milling technology

Primary Author: Joe D'Silva, P & C Pharma; Email: joe.dsilva@pandcpharma.com

Additional Author(s):
Karen Jones
Annie Schuelke
John Walton
Edmund Elder

Purpose: Compounding of oral liquids from tablets and capsules is commonly conducted using a mortar and pestle. A novel automated wet-milling technology was developed to enable compounding to be performed within a single-use multipurpose specialized plastic container. The container compounds, stores and administers the compounded product. A study was undertaken using haloperidol tablets to demonstrate the efficiency of the process, the physical-chemical and microbiological quality and personalization of the compounded formulations, and the resultant benefits accrued to pharmacists and patients.

Methods: Haloperidol tablets were compounded into 1 and 5 mg/ml oral suspension preparations. The requisite number of tablets and specified quantity of water were placed into the specialized plastic containers. The specially textured surface of the container combined with a high RPM planetary motion from a milling machine results in the conversion of the contents into a fine uniform suspension. A solid mixture of viscosity enhancers, flavors, sweeteners, buffers and preservatives was added to the suspension to produce a pharmaceutically acceptable oral liquid formula. Following wet-milling, the container served the roles of storage and administration for the compounded product. Several flavor options have been developed for use. A special high aroma formula, designated as Bananas Foster, was developed for administration to patients with dementia. Physical and chemical stability studies and an antimicrobial effectiveness test were conducted on the compounded formulas.

Results: The compounded formulas were found to have a smooth texture and the required characteristics for proper dose withdrawal. A beyond use date (BUD) of 1 month at room temperature was assigned to the compounded product. The dose uniformity results were
within 3% of the label claim. The stability study results were within 10% of the label claim. The formulas passed the antimicrobial effectiveness test.

**Conclusion:** The data demonstrate the effectiveness of the novel wet-milling technology. The automated method allows for the simultaneous compounding of up to four different products with consistent quality. The variability introduced due to manual procedures is eliminated. The employment of a single-use disposable container for compounding, storage, and administration eliminates the need for cleaning and the risk of cross contamination. Use of a fully-enclosed compounding environment with added safeguards greatly reduces the potential exposure of personnel to aerosolized powders. The novel wet-milling technology allows for the easy personalization of the compounded formulas with respect to drug concentration, flavors and viscosity.
Submission Category: Informatics / Technology / Automation

Session-Board Number: 4-099

Poster Title: Search engine optimization: Increasing accessibility to medical response documents on medical information websites for an improved customer experience

Primary Author: Neil Shah, Eli Lilly and Company; Email: neil.shah18@gmail.com

Additional Author (s):
Pooja Gandhi

Purpose: Pharmaceutical companies have started to increasingly rely on their medical information department’s webpages for healthcare professional customers to easily access medical response documents. However, medical information departments are facing challenges in adapting to complex search engine algorithms; therefore, this study explores ways to incorporate search engine optimization in an effort to improve accessibility of medical content online. To evaluate these efforts, accessibility of the documents and successful search rates before and after the addition of keywords identified through search engine optimization were measured.

Methods: A product was identified for search engine optimization efforts based on high amounts of traffic via the online medical information website and a discrepancy favoring the fulfillment of its document through the call center channel rather than the online channel. The screening ensured that the product selected had a large repository of prior search data and enough interest to measure impact after the update. The identification of new keywords for addition was based on the collection and the analysis of request data. The request data was obtained from Google searches, medical information onsite searches, and call center requests. The collected data were entered into PolyAnalyst’s Keyword Extraction tool to identify commonly used words and phrases. Keywords identified by the tool were then analyzed by the medical information employee to determine their viability for addition to currently listed keywords. To determine the impact of newly included keywords, the accessibility of the documents and the rate of successful searches were measured. The results of these two measures were obtained for two months prior to and after the update. The accessibility of the documents was measured by identifying the number of medical response documents returned per search. The rate of successful searches was obtained by dividing the number of medical response documents viewed by the number of searches conducted for that given timeframe.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: A total of 53 new keywords were added across the 100 medical response documents included in the portfolio. Nine new keywords came from the medical information onsite searches, one from Google searches, and nine from call center requests. An additional 34 keywords were added based on the medical information employee’s extrapolation of the 19 keywords identified through analytics. The keywords were primarily in the category of common misspellings, abbreviations, and commonly used terms not previously included. Accessibility to the documents improved as seen by the increase in the number of documents returned per search after the update compared to the same searches before the update (183 versus 176, respectively). Successful search rate increased from 2.63 percent (2 pages viewed/76 searched) in the two month timeframe before the update to 30.43 percent (21 pages viewed/60 searches) in the two month timeframe after the update.

Conclusion: Results from this approach showed a slight improvement in medical response document accessibility based on the two month comparison. Additionally, more than a tenfold increase in successful search rates was seen after the update compared to before the update. At one year post-launch, when inquiries about the product potentially increase, the medical information employee may benefit by utilizing search engine optimization to revamp the keywords to ensure potential gaps are addressed for an optimal customer experience.
Submission Category: Informatics / Technology / Automation

Session-Board Number: 4-100

Poster Title: Integrated pharmacy applications: enhancing pharmacist workflow efficiency

Primary Author: Glen Thompson, Crisp Regional Hospital; Email: gthompson@crispregional.org

Additional Author (s):
Hong Lam
Neil Ratcliff

Purpose: In hospitals that have some computerized physician order entry (CPOE) and some paper orders, pharmacists are required to monitor fax machines, and order scan queues in addition to checking the Pharmacy Information System (PIS) for unverified CPOE orders. Furthermore, pharmacists are required to document order counts, clinical interventions, and order turnaround time as part of quality metrics, often in another system. Pharmacist may have to access a different system to view demographic information, allergies and lab results. In order to optimize pharmacist efficiency and effectiveness, a cloud-based, integrated pharmacy application was implemented that aggregates paper and electronic orders into a single queue, displays patient demographic and lab values and facilitates the documentation of pharmacist interventions, notes, and order counts in a consolidated system.

Methods: A 73 bed hospital with 10% electronic orders and 90% written orders implemented a centralized pharmacy work flow system (PowerGridRxTM) in the 3rd quarter of 2016. This application provides pharmacist visibility for written orders that are faxed and scanned from nursing units, in addition to CPOE orders via interface messages, into a consolidated work queue. The arrival of new orders, regardless of method of ordering, CPOE or written, will audibly alert the pharmacist of new orders which eliminates the need to repeatedly scan for pending unverified orders in the PIS. The application allows the pharmacist to document the number of orders processed and the time required to process the orders. The application interfaces with laboratory and demographic data (ADT) which allows the reading of patient barcodes and presents the pharmacist with patient lab results, age, allergies, weight/height, and hospital location on a single patient summary display. Furthermore, pharmacists’ clinical interventions and notes are documented within the application to monitor clinical activities and communicate pending issues to other team members. In order to evaluate the utilization and effectiveness of the system, data was collected from July 2016 till December 2016.
Results: During the 6 month data collection period, pharmacists processed an average of 3,000 orders per month during the day shift. The number of orders flagged as STAT averaged 130 per month. The average turnaround time for all order was about 16 minutes. Pharmacist’s productivity was measured by the number of orders processed per hour. Since all orders are integrated into one consolidated system, order volume can be tracked and easily identified hourly. Clinical interventions were also documented in the system during the data collection period. The most common interventions were for pharmacy to dose, patient own medication, renal dosing and clarification of medication order. Therapeutic substitution to a formulary agent is also common as well as ensuring that patient is taking correct home medication. Cost savings per interventions were calculated by applying standardized cost saving metrics to the data above.

Conclusion: Pharmacist effectiveness, efficiency and improved workflow were achieved following the implementation of the integrated, cloud-based PowerGridRxTM system. Because all written orders and unverified CPOE orders are visible to the pharmacist in the same work queue and STAT orders are clearly flagged, pharmacists are able to more effectively prioritize orders and manage workflow. In addition, the system facilitates the capture of important metrics which allow Pharmacy administrators to generate reports on productivity per pharmacist, peak order volume periods, pharmacist clinical activities and cost saving per pharmacist interventions. Overall, the system improves pharmacist efficiency and allows the capture of comprehensive pharmacy data for managing pharmacy operations.
Submission Category: Oncology / Hematology

Session-Board Number: 4-101

Poster Title: Pharmacoeconomics analysis of capecitabine versus 5-fluorouracil/leucovorin as adjuvant therapy in stage III colon cancer in the state of Qatar

Primary Author: Daoud Al-Badriyeh, College of Pharmacy Qatar University; Email: daoud.a@qu.edu.qa

Additional Author(s):
Ahmad Alkadour
Jonas Feilchenfeldt
Amir Nounou
Shereen El Azzazy

Purpose: Capecitabine, an oral prodrug, is at least as effective as the intravenous chemotherapy 5-fluorouracil/leucovorin (5-FU) for disease free and overall survival, with enhanced safety profile, when given as adjuvant treatment of patients with stage III colon cancer after full resection surgery. Cost-effectiveness analyses of capecitabine versus 5-FU exist in literature, but these, however, are local, not comprehensive and, importantly, do not represent practices in Qatar, which can have major consequences on outcome and cost. The current study sought to conduct a cost-utility analysis of capecitabine versus its intravenous alternative 5-FU as adjuvant treatment of stage III colon cancer in Qatar.

Methods: A health state-transition model (markov model) was developed to calculate the effectiveness and incremental costs of capecitabine versus 5-FU. The three health states were: stable (disease-free), relapse (disease-progression), and death. Modeling was carried out for a lifetime horizon. Clinical outcomes were obtained from published large clinical trial data. Utility values were also extracted from literature, while treatment pattern, resource utilization and unit costs were locally extracted from the Qatari practice, utilizing medical records, expert panels, and the hospital purchasing departments. Costs were adjusted to their 2017 values. The study was from the perspective of the public hospital sector; the National Center for Cancer Care and Research (NCCCR), Hamad Medical Corporation (HMC), Qatar. The primary outcome was the quality-adjusted life-month (QALM), used in the calculation of the incremental cost-utility ratios (ICUR). Only direct medical costs were included. Discounting rate of 3% was applied for the future values of both costs and outcomes. One-way and multivariate

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
probabilistic sensitivity analyses were conducted with the Monte Carlo simulation, via @Risk 7.5, to account for uncertainty.

**Results:** During the treatment period (24 weeks), the overall direct medical costs for capecitabine were 8,550 QAR less than that of 5-FU per patient, which was mainly driven by the higher in-patient administration cost of the latter. Over a lifetime, this cost saving amount was estimated to increase to 13,220 QAR per patient. The oral drug was further associated with an improvement in survival that equals 8 QALMs compared to the IV dosage form. Sensitivity analyses confirmed the robustness of this model.

**Conclusion:** Based on the study methods, assumptions and limitations, the capecitabine is not only cost-saving, but also improves health outcomes compared to 5-FU in Qatar. This evidence might assist HMC management and procurement department in their drug formulary and insurance policy decisions, especially as capecitabine is not currently covered for reimbursement in Qatar due to higher acquisition cost.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Oncology / Hematology

**Session-Board Number:** 4-103

**Poster Title:** Multicenter study of environmental contamination with ten antineoplastic drugs: preliminary results

**Primary Author:** Laure Chauchat, Département de pharmacie et Unité de recherche en pratique pharmaceutique, CHU Sainte-Justine, Montréal, Québec, Canada; **Email:** laurechauchat@hotmail.fr

**Additional Author(s):**
Nicolas Caron
Sebastien Gagné
Cynthia Tanguay
Jean-François Bussières

**Purpose:** According USP 800, environmental wipe sampling for hazardous drugs (HD) surface residue should be performed routinely (e.g., initially as a benchmark and at least every 6 months, or more often as needed, to verify containment). In Canada, a periodical wipe sampling surveillance program has been offered annually since 2008 with three HD. The objective of this study is to monitor environmental contamination with ten antineoplastic drugs (e.g. cyclophosphamide (CP), cytarabine (CY), docetaxel (DO), 5-fluorouracil (FU), ifosfamide (IF), gemcitabine (GE), methotrexate (MT), irinotecan (IR), paclitaxel (PA) and vinorelbine (VI)) in oncology pharmacy and patient care areas of Canadian hospitals.

**Methods:** This is an evaluative study research. Twelve standardized sites were sampled in each participating center (six in the pharmacy and six in patient care areas). Samples were analyzed for the quantitative presence of CP, CY, FU, GE, IF, IR and MT and for the qualitative presence of DO, PA and VI by ultra-performance liquid chromatography-tandem mass spectrometry technology. Only descriptive statistics were performed.

**Results:** In 2017, 40 centers participated for a total of 480 samples + 40 blank samples. A total of 41.3% (198/480) of the samples were positive with at least one HD being positive per sampling site. Overall, the proportion of positive samples per HD drug sampled was, in decreasing order, CP (27.5%, 132/480), GE (13.1%), FU (12.5%), MT (6.5%), IF (6.0%), IR (3.3%), CY (2.5%), PA (0.8%), VI (0.6%) and DO (0.2%). When considering only positive sampling sites (n=198), the proportion per sampling site were from 16.7% for the arm rest in patient care

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
areas (33/198) to 3.0% for the shipment reception counter. Globally, the 50th and 75th percentile values of all 10 HD were lower than the limit of detection (LOD). The 90th percentile values were also lower than LOD except for FU (0.0685 ng/cm2), CP (0.035) and GE (0.0066). When comparing only CP, IF and MT, as previously tested in our previous annual multicenter surveillance study, the proportion of positive samples were lower in 2017 than 2016 for CP (27.5% vs 43.4%) and IF (6.0% vs 13.2%) and similar for MT (6.5% vs 6.9%). Such reduction in contamination may be attributed to numerous strategies of traces containment of HD.

**Conclusion:** Traces of each HD were detected for at least one sampling site and the proportion of positive samples varied between 0.2% for DO and 27.5% for CP. This study illustrates the feasibility of extending the Canadian environmental surveillance program from three to ten HD including a quantitative measure for seven HD and a qualitative measure (presence/absence) for the three others.
Submission Category: Oncology / Hematology

Session-Board Number: 4-104

Poster Title: Designing and implementing an oncology pharmacy satellite in a sole community teaching hospital

Primary Author: Jason Harsanye, Kingman Regional Medical Center; Email: jaharsanye@yahoo.com

Additional Author(s):
William Latimer

Purpose: Operational efficiency is extremely important in today’s healthcare model. Understanding how clinical and operational logistics impact workflow efficiency is a critical step for designing and implementing a comprehensive pharmacy service line. An oncology pharmacy satellite service demands exceptional customer outcomes and service. Interdepartmental and intradepartmental collaboration provides a well-rounded perspective for obtaining data to improve operational efficiency via the development of a future state practice model and service site for oncology practice. This project was designed to improve medication utilization, workflow efficiency and patient outcomes in the context of an oncology pharmacy service line.

Methods: An initial project scope and plan were developed via a project charter by working with internal and external stakeholders. Pharmacy satellite plans were designed in coordination with an external vendor experienced with sterile product environments. Clinical and operational metrics that impact workflow were obtained from industry best practices. These metrics were evaluated via literature review. An analysis of the current state and future state pharmacy workflow, along with value stream mapping were used to help evaluate, design and optimize workflow. In order to assess the primary outcome, time studies were performed for several process points throughout the medication dispensing process. An additional project outcome of satisfaction for patients and employees were performed via survey.

Results: The project took approximately 30 days to finalize design plans prior to presenting the business case for budget approval. The business case for an oncology pharmacy satellite service was approved to be completed during the fiscal year (FY) 2018. The project was assigned a tentative timeline of 90 days to complete onsite construction during the first and second quarters of FY 2018. In order to improve operational and patient outcomes, additional staff members were included in the budget process. New processes and workflows were established.
to streamline both clinical and operational outcomes. Implementing an oncology pharmacy satellite improved both clinical and operational outcomes, including internal and external staff satisfaction.

**Conclusion:** The project charter document served as an instrumental tool for keeping the project on track, on time, and within scope. The post project operational workflow improved both operational and clinical outcomes. Therefore, the primary outcome for the project was met by allowing employees more time to focus on providing timing medication administration, medication counseling and an explanation of medical care compliance with patients.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Oncology / Hematology

Session-Board Number: 4-105

Poster Title: Risk factors for denosumab or zoledronic acid-related osteonecrosis of the jaw in cancer patients with bone metastases

Primary Author: Hiroaki Ikesue, Kobe City Medical Center General Hospital; Email: ikesue@kcho.jp

Additional Author (s):
Moe Shimosato
Hideaki Tomita
Toshihiko Takenobu
Tohru Hashida

Purpose: Although the use of antiresorptive therapies such as denosumab or zoledronic acid (ZA) reduces skeletal-related events in patients with bone metastases, it is associated with an increased risk of osteonecrosis of the jaw (ONJ). To minimize this risk, a dental examination is recommended before starting denosumab or ZA treatment. However, some patients develop ONJ even though they consulted to dentist to assess the risk of ONJ before start the treatment with these drugs. Thus, we investigated the risk factors for ONJ in cancer patients with bone metastases who had dentist approval prior to starting antiresorptive treatment.

Methods: This retrospective study protocol was approved by the institutional review board of Kobe City Medical Center General Hospital in Japan. The medical records of adult cancer patients treated with ZA or denosumab between January 2012 and September 2016 were reviewed. Patients were excluded if they did not undergo a dental examination before starting denosumab or ZA treatment, received zoledronic acid for the treatment of hypercalcemia, could not be followed at least 1 month, or received both denosumab and ZA. ONJ was diagnosed by dentists in our hospital according to the criteria stated in the American Association of Oral and Maxillofacial Surgeons (AAOMS) position paper: (1) current or previous treatment with antiresorptive or antiangiogenic agents; (2) exposed bone or bone that can be probed through an intraoral or extraoral fistula in the maxillofacial region that has persisted for longer than 8 weeks; and (3) no history of radiation therapy for the jaws or obvious metastatic disease in the jaws. To identify the risk factors for developing ONJ, univariate and multivariate Cox proportional hazards regression models were used. P values of < 0.05 were considered statistically significant.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** A total of 375 patients who were treated with denosumab (n = 216) or ZA (n = 159) were included in this study. The median numbers of denosumab and ZA treatment were 7 (1-41) and 5 (1-55), respectively. Twenty-five (6.7%) patients developed ONJ, of which 19 received denosumab (8.8%) and 6 received ZA (3.8%). The median time to onset of ONJ was 13.5 (4.8-49.1) months and 33.4 (15.0-43.3) months, respectively. Multivariate Cox proportional hazards regression analysis revealed that older patients (> 65 years) [hazard ratio (HR) = 5.24; 95% confidence interval (CI) = 1.90-17.71; P = 0.001], denosumab treatment (HR = 5.16; 95% CI = 1.97-16.12; P = 0.001), and concomitant use of antiangiogenic agents (HR = 3.16; 95% CI = 1.30-7.29; P = 0.013) were significantly associated with ONJ.

**Conclusion:** In cancer patients with bone metastases receiving antiresorptive treatment, an age of over 65 years, treatment with denosumab, and concomitant use of antiangiogenic agents were revealed to be significant risk factors for developing ONJ. Therefore, patients with these risk factors should be monitored carefully, even if they received approval from a dentist before starting treatment.
Submission Category: Oncology / Hematology

Session-Board Number: 4-106

Poster Title: Evaluation of medication adherence and pharmacokinetics of dasatinib towards complete molecular response in newly diagnosed Japanese patients with chronic myeloid leukemia

Primary Author: Takuya Iwamoto, Mie University; Email: taku-iwa@clin.med.unic.mie-u.ac.jp

Additional Author(s):
Fumihiko Monma
Kohshi Ohishi
Masahiro Okuda
Naoyuki Katayama

Purpose: Tyrosine kinase inhibitors provide a remarkable improvement of survival for patients with chronic myeloid leukemia (CML). However, a decrease in adherence leads to undesired therapeutic outcome. As for imatinib, adherence is shown to be a critical factor to achieve major and complete molecular responses. As for dasatinib, the rate of major cytogenetic response and the incidence of pleural effusion were reported to correlate with steady-state average plasma concentrations and trough concentrations, respectively. In this study, we prospectively investigated the relationship among adherence, pharmacokinetics, response, and adverse effects in the treatment with dasatinib.

Methods: This study was a prospective cohort study of newly diagnosed CML patients at 4 general hospitals located at Mie prefecture and Mie University Hospital. This study was conducted from December 2012 to February 2015. Patients started to receive dasatinib 10 mg once daily. dasatinib doses were changed according to the clinical need. Medication Event Monitoring System (MEMS) was used for assessing medication adherence during 12 months and medication possession ratio (MPR). MPR was defined as follow; MPR = (actual dasatinib dosage during 12 months) / (prescribed dasatinib dosage during 12 months) x 100. Area under the concentration-time curve (AUC) of dasatinib was monitored using LC-MS/MS at day 14 from the start of dasatinib administration. Plasma trough concentrations were also obtained at day 28, and 3, 6, 9, and 12 months after treatment. Therapy response was assessed at 3, 6, 12 months after treatment. This study was approved by the Ethics Committee of Mie University, and written informed consent was obtained from patients (UMIN No. 0009770).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: Ten patients were included from 5 hospitals in this study. The median age of the patients was 68 years old, and 9 of 10 patients were male. Based on CML prognostic score, 5 patients were classified as low risk, and the rests of 5 patients were intermediate risk. Extremely high medication adherence of dasatinib was observed; the median MPR was 98.3% and its range was between 89.4% and 100%. All patients achieved major molecular response (MMR) within 12 months, and half of them achieved MMR within 6 months from the initiation of dasatinib treatment. The ROC analysis revealed that cutoff value of dasatinib AUC was 350 ng x h/mL (average concentration during 24 h: 14.6 ng/mL) for the achievement of MMR within 6 month. In this analysis, accuracy was 0.8, and both of sensitivity and specificity were 0.8. One patient with intermediate risk harboring a dasatinib AUC 468.2 ng x h/mL did not achieve MMR within 6 months. Three patients withdrew dasatinib within 12 months because of the following side effects; pleural effusion, neutropenia, fever, and diarrhea with intestinal edema. Observed edematous side effects were developed when plasma dasatinib trough concentrations were more than 3 ng/mL.

Conclusion: In this study, adherence was more than 98% and all patients achieved MMR within 12 months. Under this condition, pharmacokinetic analysis was performed. Although this study had small number of patients, dasatinib AUC more than 350 ng x h/mL (average concentration: 14.6 ng/mL) was considered to be cutoff value for achievement of MMR within 6 months with 80% accuracy. These data were consistent with previous reports showing that average dasatinib concentrations more than 15.8 ng/ml was associated with major cytogenetic response within 6 months. Trough concentrations more than 3 ng/mL also appeared to be associated with edematous side effects.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Oncology / Hematology

Session-Board Number: 4-107

Poster Title: Retrospective claims data comparison of incidence of febrile neutropenia (FN) between biosimilar filgrastim-sndz/EP2006 and reference filgrastim in patients treated with chemotherapy regimens for non-myeloid cancers

Primary Author: Lincy Lal, Optum; Email: lincy.lal@optum.com

Additional Author(s):
Stephanie Korrer
Sanjeev Balu
Kim Campbell
Lee Schwartzberg

Purpose: Granulocyte colony-stimulating factors (G-CSFs) are recommended to decrease the incidence of FN in patients with non-myeloid cancers undergoing treatment with chemotherapy (CT), with higher than 20% risk of neutropenia per ASCO and NCCN guidelines. Very limited data comparing biosimilar filgrastim-sndz/EP2006 and reference filgrastim exists outside of clinical trials in US. This retrospective study evaluates the proportion of patients with FN across cycles 1 through 6 of CT treatment between biosimilar filgrastim-sndz/EP2006 and reference filgrastim.

Methods: Non-myeloid cancer patients enrolled in commercial and Medicare advantage plans between March 2015 and June 2016 (Optum Research Database) and received filgrastim-sndz [EP2006; Zarxio (Sandoz Inc. US), Zarzio (Hexal AG Germany)] or reference filgrastim [Neupogen (Amgen Inc.)] during at least 1 completed CT cycle for a total of 6 cycles were included in the study. Patients receiving hematopoietic stem cell transplants, pregnant patients, and patients with missing data were excluded. Proportion of patients with FN in CT cycles 1-6 was evaluated between the two cohorts using equivalence testing after adjusting for differences in baseline demographic and clinical characteristics by the inverse probability of treatment weighting of propensity scores method. 90% confidence intervals were calculated using the bootstrap method. FN was identified using ICD-9 codes for neutropenia, fever, and bacterial and fungal infections. The incidence of FN between the two cohorts was considered equivalent if the confidence intervals were within +/- 6.0%, based on PIONEER study (NCT01519700) and literature.
Results: A total of 3,459 patients (2916 (84%) solid cancer patients) were analyzed (162 filgrastim-sndz and 3,297 reference filgrastim patients). At baseline and before weighting, patients in the filgrastim-sndz cohort were younger versus the reference filgrastim cohort (average age of 60.9 versus 64.8 years; p less than 0.001), had a higher % of males (42.1% versus 35.6%; p equals 0.014), a lower % who initiated G-CSF within 5 days of CT initiation [prophylaxis for FN] (45.6% versus 51.6%; p equals 0.027), a lower % with metastatic cancer (39.0% versus 46.6%; p equals 0.005), and a higher % with commercial insurance (61.0% versus 44.2%; p less than 0.001). Weighted adjusted results were equivalent between the 2 cohorts, respectively: neutropenia and fever: 0.81% (filgrastim-sndz) versus 0.61% (reference filgrastim); difference: 0.20 (90% CI: -0.57 - 1.56); neutropenia and infections (bacterial or fungal): 1.21% (filgrastim-sndz) versus 1.33% (reference filgrastim); difference: -0.12 (90% CI: -1.17 - 2.28); neutropenia and infections and fever: 0% (filgrastim-sndz) versus 0.14% (reference filgrastim); difference: -0.14 (90% CI: not able to calculate due to zero events).

Conclusion: This retrospective claims data study demonstrated statistical equivalence in the proportion of patients with FN (based on different definitions of FN) in CT cycles 1-6 treatment between biosimilar filgrastim-sndz/EP2006 and reference filgrastim in real-world patients in US with non-myeloid cancers after adjusting for differences in baseline demographic and clinical characteristics.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Oncology / Hematology

Session-Board Number: 4-108

Poster Title: Evaluation of an improvement strategy on the preparation of cytostatic drugs

Primary Author: Alba Leon Barbosa, Hospital Fundación de Jove; Email: barbosa.leon.alba@gmail.com

Additional Author(s):
Ana Lozano Blazquez
Monica Carnajales
Ruben Pampin Sanchez
Aitor Ayastuy

Purpose: The avoidance of errors in the processing of chemotherapy orders is an important component in the pharmacy department’s medication-use safety initiatives. The objectives were to evaluate the improvement strategy introduced in the year 2012 in order to avoid and detect medication errors (MEs) during the preparation of cytostatic drugs in the pharmacy department (PD), and to introduce a new corrective strategy, if needed.

Methods: All intravenous cytostatic drugs prepared by the PD were registered between January 2012 and December 2014 thanks to the program Oncofarm - (R). All MEs occurred during the preparation were recorded thanks to the quality area of such program. Recorded data are as follows: patient, type and cause of ME, number of drug related problems (DRP), category and classification of DRP, if the problem is potential or manifest, pharmacists actions (PA) and the final seriousness of ME/DRP. The method IASER - (R) was used to classify MEs. In order to avoid and detect MEs related to preparation of cytostatic drugs, residual vials were controlled through an automated management: semi-quantitative method to validate the finished product. The elaboration paper, printed for each patient with all the mixtures to be made, describes quantitatively components needed for each preparation, so the computer program records all remaining quantities for each vial and proposes its reutilization in the following mixtures with the same active principle. A double check was established to validate the method: first check when processing the elaboration for each patient and second check at the end of the day through a report where it is detailed the relation between used drugs and the remaining mg/mL of each unit. In this way, this system detects MEs applicable to each preparation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** A number of 64,971 preparations of cytostatic drugs were made. When preparing those drugs, 12 MEs were detected, so an error rate of 0.02%. A 67% rate of MEs were classified as incorrect dose and 33% as incorrect/omitted medicines. All of them were caused by a memory failure/carelessness. The identified MEs generated 12 DRPs: 6 (50%) were related to security category, 4 (33%) to effectiveness, 1 (8%) to symptoms and 1 (8%) to adhesion. The resultant distribution of classification is as follows: 6 (50%) overdose, 3 (25%) underdose, 1 (8%) inappropriate medicine, 1 (8%) additional treatment needed and 1 (8%) unfulfillment. 10 (83%) were potential DRPs - patient not reached - and 2 (7%) were manifest DRPs. A number of 14 PAs were carried out: 12 were preventive actions -75% were to clarify/amend preparation-dispensation and 25% to prevent side effects; and 2 were educational actions. The final seriousness of manifest DRPs was classified as follows: MEs/DRPs that caused reversible damage with additional treatment needed.

**Conclusion:** The error rate found in our study has been lower to the published version. The semi-quantitative method allows us to detect MEs although it cannot avoid that these MEs reach the patient. A corrective strategy must be introduced to the existing one to ensure the highest quality regarding all pharmacy-made preparations.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Oncology / Hematology

Session-Board Number: 4-110

Poster Title: Usefulness of blood calcium concentration as a index for hypomagnesemia in patients administered anti-EGFR antibodies

Primary Author: Toshiyasu Tsujii, Toyooka Public Hospital; Email: toshiyasu-tsujii@toyookahp-kumiai.or.jp

Additional Author(s):
Kaori Nakae
Daisuke Kise
Hiroki Ueda
Masahiro Moriyama

Purpose: Hypomagnesemia is one of the characteristic side effects of anti-human epidermal growth factor receptor (EGFR) monoclonal antibodies, i.e. cetuximab and panitumumab. The major mechanism of anti-EGFR antibody-induced hypomagnesemia is suppression of EGFR-mediated urinary Magnesium reabsorption in both the renal tubule and the intestinal tract. Since Magnesium is known to affect blood Calcium levels through regulation of parathyroid hormone (PTH) secretion, we investigated the correlation between Calcium and Magnesium concentrations in blood.

Methods: In the period of April 2012 to April 2017, blood Magnesium and Calcium concentrations (albumin corrected values) of 33 patients undergoing treatment with either cetuximab or panitumumab at Toyooka Public Hospital were measured. Laboratory data of blood Magnesium and Calcium concentrations in the 33 patients were collected from electronic medical records, and analyzed for changes in the two ions. The data featured of the patients were: cetuximab-treated 19 cases (male=13, female=6, average=66. 44 years), panitumumab-treated 14 cases (male=10, female=4, average=60. 24 years) including colon, rectal and cecum cancers. The severity of Magnesium and Calcium concentration decline was graded according to Common Terminology Criteria for Adverse Events ver4. 0 (CTCAE ver4. 0 Japanese translation JCOG version). The Incidence of hypomagnesemia was studied for magnesium oxide, commonly used as laxatives, -co-treated and -non-treated groups. The relationship between hypomagnesemia and skin toxicity, a characteristic side effects of human anti-EGFR monoclonal antibodies, was investigated. Skin toxicities included pruritus, acniform dermatitis, skin desquamation, exfoliative dermatitis, paronychia, nail disorder, skin fissures, skin laceration,
pruritic rash, pustular rash, skin infection, and skin ulceration. Selected skin toxicities were graded according to Common Terminology Criteria for Adverse Events ver4.0 (CTCAE ver4.0 Japanese translation JCOG version). Differences among patient background between the hypomagnesemia and non-hypomagnesemia groups was investigated.

**Results:** The incidence of hypomagnesemia after the start of anti-EGFR antibody administration was 54.5 percent (18/33 cases). About 1.8 percent of the patients (6/33 cases) had Grade 2 hypomagnesemia, and 9.1 percent (2/33 cases) had Grade 3 hypomagnesemia. The incidence of hypocalcemia after the start of anti-EGFR antibody administration was 54.5 percent (18/33 cases). Six percent of the patients (2/33 cases) had Grade 2 hypocalcemia. Changes in blood Magnesium and Calcium concentration showed a significant correlation, which could be expressed using the following equation, Calcium concentration = 1.54 x (Magnesium concentration) + 7.61. During treatment with anti-EGFR antibodies, fifteen patients were co-treated with oral magnesium oxide preparation for constipation. No significant difference in incidence of hypomagnesemia was observed between the magnesium oxide-co-treated and non-treated groups. In the anti-EGFR antibody-treated patients, the incidence of Grade 0 or 1 skin toxicity was 30.3 percent (10/33 cases) and that of Grade 2 or higher skin toxicity was 69.6 percent (23/33 cases). Magnesium values in each group were 1.80, and 1.51 mg/dL. No changes in patient background was observed between patients with and without hypomagnesemia.

**Conclusion:** The present study suggests that hypocalcemia is highly correlated with hypomagnesemia. If hypocalcemia is observed in patients administered anti-EGFR antibodies, early evaluation of blood Magnesium concentration and prompt supportive care are required to prevent aggravation of hypomagnesemia. Since there is no characteristic clinical symptom in early stages of hypomagnesemia, it is easily overlooked until it becomes severe.
2017 Midyear Clinical Meeting Professional Poster Abstracts

Submission Category: Oncology / Hematology

Session-Board Number: 4-111

Poster Title: National analysis of length of stay, costs, and mortality associated with acute graft-vs-host disease during initial allogeneic hematopoietic stem cell transplantation hospitalization

Primary Author: Jingbo Yu, Incyte Corporation; Email: jyu@incyte.com

Additional Author(s):
Shreekant Parasuraman
Anshul Shah

Purpose: Acute graft-vs-host disease (aGVHD) is a common complication of allogeneic hematopoietic stem cell transplantation (HSCT). aGVHD is a significant cause of morbidity and mortality after HSCT. This study estimated the length of stay (LOS), costs, and mortality rates of patients in the United States who developed aGVHD during initial hospitalization for allogeneic HSCT.

Methods: This was a retrospective analysis of inpatient discharges between 2009 and 2013 from the Nationwide Inpatient Sample (NIS) database. NIS is a representative (20% stratified) sample of all discharges from US hospitals included in the Healthcare Cost and Utilization Project (HCUP). Discharges for allogeneic HSCT admissions for patients with aGVHD (International Classification of Diseases, Ninth Revision [ICD-9] 279.51) were compared with patients without GVHD. Costs were calculated from hospital charges using a standard HCUP charge-to-cost ratio. The mortality rate at discharge was reported and compared using chi-square test. LOS and costs were compared using Wilcoxon rank sum test. Correlation between LOS and charges or costs was calculated using Pearson coefficient.

Results: The analysis involved 729 inpatient discharges for patients with aGVHD and 5949 discharges without GVHD. Most patients in both groups were male (60% vs 58%), white (67% vs 68%), and had private insurance (60% vs 63%). Mean age was 39 and 45 years for patients with and without aGVHD, respectively (P < 0.001), with 29% of patients with aGVHD and 16% of those without GVHD < 18 years old (P < 0.001). The stem cell source for patients with vs without aGVHD was 69% vs 77% peripheral blood, 16% vs 16% bone marrow, and 14% vs 6% cord blood, respectively. The in-hospital mortality rate was 16% for patients with aGVHD vs 5% without GVHD (P < 0.001). Mean unadjusted LOS was significantly longer (P < 0.001) and mean

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
unadjusted costs were significantly higher (P < 0.001) for patients with aGVHD compared with patients without (54 vs 30 days; $218,425 vs $122,387, respectively). Among adult patients, LOS, costs, and mortality rate were 47 vs 27 days, $196,330 vs $108,504, and 12% vs 4%; among patients < 18 years old, LOS, costs, and mortality rate were 71 vs 45 days, $274,173 vs $194,127, and 4% vs 1% for patients with aGVHD vs without GVHD, respectively. Costs were proportional to LOS (r=0.711, P < 0.001).

**Conclusion:** Occurrence of aGVHD during HSCT admissions resulted in almost doubling of LOS and costs, and tripling of mortality rate. These incremental healthcare resource utilization, costs, and mortality rates were observed in both adults and patients younger than 18. Effectively mitigating aGVHD may increase survival rates of transplant patients and reduce LOS and subsequent inpatient resource use for HSCT.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pain Management / Palliative Care

Session-Board Number: 4-112

Poster Title: Multidisciplinary ketamine for pain clinical practice guideline at a large tertiary care hospital

Primary Author: Lama Kanawati, MedStar Washington Hospital Center; Email: lama.kanawati@medstar.net

Purpose: Pain management is important for patient care. Use of ketamine for pain provides an additional option in pain medication choices, particularly in difficult to treat pain. The objective of this project is to develop a ketamine for pain clinical practice guideline that will be used for various indications and across different settings in the hospital.

Methods: Pain committee members took lead in developing this clinical practice guideline. The guideline was developed with input from pain management, anesthesia, emergency department, critical care, and palliative care providers. Ketamine use will be in the emergency department, perioperative area, procedural areas, intensive care and non-intensive care units, and in palliative care.

Results: Indications for ketamine use include post major surgery, procedural pain, chronic pain with high opioid requirements, refractory pain, neuropathic pain, opioid induced hyperalgesia, opioid tolerance and intolerance, and acute traumatic and non-traumatic pain. Contraindications, precautions, patient education, side effects, and management of complications are outlined. There are multiple options for ketamine administration routes including one time intravenous and continuous infusion, intranasal, subcutaneous, intramuscular and oral. Patient assessment and monitoring varies depending on the administration setting and is specified for one time doses, continuous intravenous and oral administration. Dosage recommendations and titration parameters are also provided.

Conclusion: Multidisciplinary approach is important for development of ketamine for pain clinical practice guideline for implementation in various hospital settings and for various indications.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Pain Management / Palliative Care

**Session-Board Number:** 4-113

**Poster Title:** Evaluation of a care pathway incorporating liposomal bupivacaine injection to standard care for patients undergoing total knee arthroplasty

**Primary Author:** Daniel Knolhoff, OSF Healthcare; **Email:** daniel.r.knolhoff@osfhealthcare.org

**Additional Author(s):**
Kyle Shick
Jeremy McGarvey
Susan Peterson

**Purpose:** Liposomal bupivacaine is a long-acting amide anesthetic that can be used intraoperatively as an alternative pain management strategy to help improve postoperative pain and outcomes. Effective postoperative pain control is a critical element in recovery for patients undergoing total knee arthroplasty (TKA). The goal of this study was to measure the effects of liposomal bupivacaine on postoperative length of stay, total direct costs, postoperative opioid use, pain scores, and distance ambulated on patients that underwent TKA.

**Methods:** This study was an institutional review board-approved, retrospective cohort study of patients undergoing TKA at a single U.S. hospital from February 1, 2015 to December 31, 2015. Men and women aged 18-89 undergoing a primary TKA were included in this study. Patient data was collected for the historical control cohort for eligible patients from December 31, 2013 to January 31, 2015. The control group received the standard of care for TKA which included femoral nerve block, and the intervention group received the standard of care in addition to a liposomal bupivacaine injection mixture as part of the patients intraoperative pain management care. Postoperative length of stay, total direct costs, postoperative opioid use, pain scores (visual analog pain scale 1-10), and distance ambulated were studied for both groups that underwent TKA.

**Results:** A total of 322 patients that underwent TKA received the liposomal bupivacaine injection mixture and 322 propensity matched patients received the standard of care. The intervention group had a significantly lower mean length of stay compared to the control group, 2.59 days vs 2.96 days respectively (p less than 0.05). Total direct costs were lower in the intervention group, $9,654 vs $10,124 (p less than 0.05), and total opioid use was lower in the intervention group, 54.85 vs 91.8 IV morphine equivalents (p less than 0.05). The intervention
group also had significantly decreased pain scores with activity and at rest, 4.29 vs 4.81 (p less than 0.05) and 3.62 vs 4.45 (p less than 0.05). The intervention group also had increased distance ambulated at first attempt, 88.64 vs 67.57 feet (p less than 0.05). The intervention group did not have a significant difference in last attempted walking distance.

**Conclusion:** Use of a liposomal bupivacaine injection mixture intraoperatively as an alternative to the standard of care for TKA was associated with a significantly reduced length of stay, reduced total direct costs, lower pain scores at rest and during activity reported on the first recording after surgery, increased distance ambulated on the first attempt following surgery, and decreased use of opioids in the postoperative phase of care compared to the control group.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Pain Management / Palliative Care

**Session-Board Number:** 4-114

**Poster Title:** Implementation of the alternatives to opiates (ALTO) protocol for acute pain management in the emergency department

**Primary Author:** Ethan Nhan, AtlantiCare Regional Medical Center; Email: ethan.nhan@atlanticare.org

**Additional Author(s):**
Shimeng Liu
Reva Dubin
Thomas Brabson
Joseph Reilly

**Purpose:** Opioid abuse and addiction is an increasing concern in the United States. Alternatives to Opiates (ALTO) is a novel pain management protocol developed by St. Joseph’s Regional Medical Center that utilizes an opioid-free, multimodal approach to treating patients with select pain indications in the emergency department (ED). Our institution adopted the protocol for the purpose of reducing the use of opioids as first-line agents and increasing awareness of appropriate opioid prescribing. This retrospective evaluation examined the impact of the ALTO protocol implementation on opioid utilization at our institution.

**Methods:** The ALTO pain protocol was approved in June 2016 by the Pharmacy and Therapeutics Committee for use in patients who present to our ED locations with any of the following 5 indications: musculoskeletal pain, acute on chronic lower back pain, extremity fracture or joint dislocation, renal colic, or migraine headache. Education was provided to the ED and pharmacy departments on the use of the ALTO protocol and the significance of opioid abuse. Computerized physician order entry (CPOE) order sets were built to facilitate ordering and monitoring. In this evaluation, adult patients who were discharged from our ED and have received pharmacologic treatment for the above pain indications were identified by International Classification of Diseases (ICD) codes using electronically generated reports. Patient data were collected and compared 9 months before (October 2015 to June 2016) to 9 months after (July 2016 to March 2017) the protocol implementation. The primary outcome was the percentage of patients treated with opioids. Secondary outcomes included ED length of stay and cost of ED visit. Statistical analysis was performed using chi-square test when appropriate. This evaluation was approved by the institutional review board.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: A total of 4969 patients before and 5221 patients after the protocol implementation were included in this evaluation. The percentage of opioid-treated patients was significantly reduced from 41.5 percent to 32.1 percent post-protocol implementation, demonstrating a relative risk reduction of 23 percent (p-value less than 0.0001). The greatest reduction in opioid use was seen in musculoskeletal pain with a relative risk reduction of 34 percent (p-value less than 0.0001). The average ED length of stay slightly increased from 173 minutes to 179 minutes, while the average ED cost per patient remained similar at 536 dollars before and 537 dollars after the protocol implementation.

Conclusion: The ALTO protocol has been an effective tool for decreasing opioid utilization in the ED at our institution without considerably affecting ED length of stay or cost. Further evaluations are needed to identify opportunities for improvement.
Submission Category: Pain Management / Palliative Care

Session-Board Number: 4-115

Poster Title: Multi-hospital medication use evaluation of liposomal bupivacaine in various surgery types

Primary Author: Nisha Pherwani, Cardinal Health; Email: nisha.pherwani@cardinalhealth.com

Additional Author (s):
Jennifer Van Cura
Steve Lundquist

Purpose: Post-operative pain remains concerning for patients, and inadequate pain relief leads to complications such as anxiety, decreased satisfaction, late ambulation and rehabilitation, increased length of stay (LOS), increased costs, and chronic pain. Liposomal bupivacaine (LB) is marketed to provide adequate pain relief for post-surgical multi-modal pain management, while decreasing opioid use and decreasing LOS. Studies have shown inconsistent results or are manufacturer funded. The purpose of this medication use evaluation was to provide an unbiased comparison of LB across surgery types compared to standard non-liposomal based pain protocols.

Methods: This retrospective chart review involving 13 community hospitals was performed from July 2014 to June 2015. Data was collected for adult patients undergoing various surgery types (total hip arthroplasty, total knee arthroplasty, inguinal hernia repair, hemorrhoidectomy, bunionectomy, breast surgery, obesity-related surgery, spinal surgery, or other orthopedic, thoracic, or abdominal surgery) receiving LB or not receiving LB, serving as the control population. Patients were excluded if they were under 18 years, had previous opioid dependence, hypersensitivity to amide-type local anesthetic, did not evaluate pain using a numeric rating scale, or had complications occur during surgery, such as excess bleeding or acute sepsis. Propensity scoring was used as a “quasi-randomization” to ensure that patients of similar demographics were compared. Patients were matched on the following characteristics: age, gender, race, weight, and surgery type. The primary endpoint was LOS (for inpatients) and secondary endpoints included concurrent analgesic consumption and pain scores. To compare opioid usage between the groups, all opioids were converted to IV morphine milligram equivalents (MME). Non-opioids were compared on a mg-per-mg basis by drug. Numeric pain scores were collected as a mean pain score over 24 hours on post-operative days (POD) 0, 1, and 2. Safety was evaluated by reviewing adverse events. Note: all patient information was

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: Data was reviewed for 660 patients. After applying inclusion criteria and propensity matching, 256 inpatients and 46 outpatients were evaluated. No statistical differences occurred in demographics between the matched patient samples. The overall LOS was significantly lower in the LB arm (3.2 vs 4.4 days, \( p < 0.0001 \)). When stratified by surgery, only LB knee surgery patients had a significantly lower LOS, (2.8 vs 4.2 days, \( p < 0.0001 \)). For other surgery types, there was no statistical difference in LOS. LB at the FDA approved dose of 266 mg is equivalent to 300 mg bupivacaine HCl, which is lower than the median dose for most patients (100-150 mg). Patients receiving higher doses had LOS similar to the LB arm. For pain score endpoint, inpatients had no difference on POD0 and scores were significantly higher in the LB arm on POD 1 and 2. In outpatients, pain scores in the control arm and LB arm showed no statistical difference. With opioid consumption, there was no statistical difference for inpatients. Outpatients in the LB arm received higher doses of opioids (22.5 MME vs 15 MME, \( p=0.01 \)). Non-opioid consumption was similar in both arms. There were statistically more nausea events in the inpatient LB group.

Conclusion: There were several limitations to this study, including the non-standardized pain management protocol and various surgery techniques across several hospitals. The use of LB led to a decrease LOS in knee surgery patients, but not in any other surgery type. Furthermore, patients receiving the drug had increased or similar pain scores and opioid consumption. Therefore, while LB may have a role in knee surgery patients; it cannot be recommended universally for all surgery types. In addition, a review of literature in knee surgery has shown inconsistent results and recent guidelines have recommended against the use of LB.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Pain Management / Palliative Care

**Session-Board Number:** 4-116

**Poster Title:** The use of olanzapine as an adjunctive treatment for pain in palliative care patients

**Primary Author:** Nadine Siazon, Scripps Mercy Hospital; **Email:** nadine.a.siazon@gmail.com

**Additional Author (s):**
Harminder Sikand

**Purpose:** The prevalence of breakthrough pain in patients receiving chronic opioid therapy has been reported to be as high as 50 to 75%. Pain experienced by a palliative care patient is a complex issue often involving physical, psychological, spiritual, and social aspects. Due to this complexity, a multimodal approach to pain management may be necessary. The use of alternative agents, such as atypical antipsychotics, shows promise in a few studies, but requires additional evidence to further support its efficacy.

**Methods:** A retrospective and prospective observational study of palliative care patients prescribed oral olanzapine for chronic and/or refractory pain in hospitalized patients was conducted. Patients were identified via the Palliative Care Quality Network (PCQN) database. Patients were included in the study if their data collection card was positive for assessment of pain symptoms, a psychosocial need, and were prescribed at least 1 opioid medication in the hospital. The primary endpoint of the study was the change in total daily oral morphine equivalents used after the addition of olanzapine. Secondary endpoints include the change in numeric pain scores, number, frequency and duration of opioid use, length of stay, and discharge disposition.

**Results:** A total of 125 patients were screened for eligibility through the PCQN database records from 2014 to 2017. After exclusion criteria, 7 patients were included in the initial study group analysis. Olanzapine dosing regimens varied with each patient from 2.5 mg to 10 mg per dose and frequency varied from as needed to scheduled doses three times daily. Of the initial study group patients, 4 patients had incomplete documentation of pain scores and/or opioid usage. Therefore, a subgroup analysis was conducted. Total daily morphine equivalents decreased for 2/3 patients within the first 2 days, but increased overall by day 7. One patient saw a decrease in total daily morphine equivalents from 120 mg to 5 mg by day 4 with no additional opioid use
after day 4. PCQN-reported pain scores showed a steady decline in for all 3 patients in the subgroup within the first week of olanzapine use.

**Conclusion:** The addition of olanzapine to opioid medications was associated with a decrease in pain scores within the first week of use. Therefore, olanzapine can be considered as an adjunct to opioids to decrease the severity of pain when a psychosocial component is present.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Pain Management / Palliative Care

**Session-Board Number:** 4-117

**Poster Title:** Impact of concomitant opioid analgesics and cachexia stage on pregabalin pharmacokinetics and central symptoms in cancer patients

**Primary Author:** Nozomi Yoshikawa, Hamamatsu University School of Medicine; **Email:** nozomi88@hama-med.ac.jp

**Additional Author (s):**
Takafumi Naito
Tatsuya Yagi
Junichi Kawakami

**Purpose:** Pregabalin, a GABAergic anticonvulsant, is commonly used for the treatment of cancer-related neuropathic pain. In the pain relief treatment with pregabalin, interindividual variation is observed in the incidence of adverse effects including central symptoms. Although pregabalin is predominantly excreted unchanged in the urine, renal function cannot fully explain the variation in the incidence of central symptoms in clinical settings. In addition, the relationship between the pregabalin pharmacokinetics and central symptoms is unclear. The purpose of this study was to evaluate the plasma concentration of pregabalin and central symptoms based on concomitant opioid analgesics and cachexia stage in cancer patients.

**Methods:** Seventy cancer patients were enrolled in this study. All patients were treated with oral pregabalin capsule twice daily for at least 2 weeks for cancer-related neuropathic pain at Hamamatsu University Hospital. Patients receiving longer-acting benzodiazepines and those with severe kidney or liver dysfunction and cerebrovascular disease were excluded in this study. Blood specimens were drawn into tubes at 12 hours after the evening dosing at steady state. Plasma concentration of pregabalin was determined by an isocratic ultra-high performance liquid chromatography coupled to fluorescence detection. The estimated glomerular filtration rate (eGFR) was calculated as a renal function marker based on serum creatinine with an equation developed for a Japanese population. The Glasgow prognostic score classified using serum albumin and C-reactive protein (CRP) was used to evaluate the cancer cachexia stage. The incidence of central symptoms including dizziness and somnolence after starting pregabalin treatment was collected from medical records. This study was approved by the Ethics Committee of Hamamatsu University School of Medicine.
Results: The interquartile range of the plasma pregabalin concentration was 0.43 to 1.2 μg/mL per mg/kg and its pharmacokinetic variation was observed in cancer patients. The plasma concentration of pregabalin showed a negative correlation with eGFR (coefficient of determination equals 0.25, P less than 0.01). Multiple linear regression analyses identified the following factors influencing on plasma concentration of pregabalin: eGFR (P less than 0.01, standardized partial regression coefficient (beta) equals 0.54), concomitant use of opioid analgesics (P less than 0.01, beta equals 0.24), serum CRP (P less than 0.01, beta equals 0.26), and Glasgow prognostic score (P less than 0.01, beta equals 0.24). The incidence of central symptoms was not associated with the absolute plasma concentration of pregabalin, eGFR, serum CRP, and Glasgow prognostic score. In contrast, concomitant opioid analgesics with pregabalin increased the incidence of central symptoms (P equals 0.04, odds ratio was 3.1).

Conclusion: The plasma concentration of pregabalin was affected by concomitant opioid analgesics and cachexia stage in addition to renal function in cancer patients. However, the pregabalin concentration and cachexia stage did not strongly alter the incidence of central symptoms. Cancer patients receiving opioid analgesics concomitantly with pregabalin had the higher risk of central symptoms including dizziness and somnolence.
Submission Category: Pediatrics

Session-Board Number: 4-118

Poster Title: Perampanel use in the treatment of pediatric epilepsy

Primary Author: Jon Cokley, Miami Children's Hospital; Email: jon.cokley@gmail.com

Additional Author (s):
Prakash Kotagal
Jessica Hoover

Purpose: Despite multiple antiepileptic agents on the market, there remains a number of epilepsy syndromes resistant to therapy. Perampanel is a novel antiepileptic drug approved as adjunctive therapy for partial and primary generalized seizures in patients greater than 12 years of age. There are minimal reports exclusive to the pediatric population. The purpose of this study is to assess outcomes of perampanel in pediatric patients in a large comprehensive epilepsy center.

Methods: Patients included in this single center, retrospective medical chart review were children (< 18 years) with epilepsy receiving perampanel between October 2012 and August 2016. Patients with known hypersensitivity to perampanel, severe hepatic or renal impairment, or pregnancy were excluded. The primary outcome was defined as a reduction in seizures greater than 50% from patient baseline. Secondary outcomes assessed safety and tolerability defined by the number of reported side effects and side effects requiring treatment discontinuation.

Results: Of 14 patients meeting study inclusion criteria 64% (N=9) received perampanel for intractable focal or multifocal epilepsy. The average patient age was 11 (range 4-17 years). Reduction in seizure burden greater than 50% was reported in 50% of patients (N=7). Discontinuation due to negative effect on seizure burden occurred in 14% (N=2) of patients. One of these patients had an autoimmune disorder, Rasmussen encephalitis and may have had subsequent disease progression. The second patient with negative seizure response received therapy for absence seizures. Severe treatment-emergent adverse events occurred in one patient, leading to discontinuation due to concern for polytherapy induced encephalopathy. An additional patient terminated therapy without mention of cause, though complaints of depressed mood, anxiety, and decreased energy may have led to preemptive discontinuation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
The most common side effect was fatigue occurring in 14% of patients (N=2). Other reported side effects included cognitive dysfunction (N=1), ataxia (N=1) and aggression (N=1).

**Conclusion:** Overall perampanel was effective in seizure control and well tolerated with minimal treatment related side effects. Further controlled trials are warranted to better understand perampanel in this population.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pediatrics

Session-Board Number: 4-119

Poster Title: Incidence of Clostridium difficile infection and associated risk factors among paediatric inpatients at Hamad General Hospital, a tertiary teaching hospital in Qatar: one-year retrospective study

Primary Author: Ahmed Khalil, clinical pharmacist at Hamad medical corporation; Email: akhalil7@hamad.qa

Additional Author(s):
Emad elmagboul
Anand Deshmukh
Asmaa Mohamed
Ahmed Elmasoudi

Purpose: Over the past decade, Clostridium difficile infection (CDI) has become one of the most serious hospital-acquired infections in paediatric populations. The primary objective is to assess the incidence of CDI and identify associated risk factors among paediatric inpatients at Qatar’s Hamad General Hospital (HGH). The secondary objectives are to evaluate treatment protocols (cured, failure, recurrence), associated outcomes, and the importance of antibiotic stewardship to reduce the risk of CDI. This is the first study in Qatar for assessing the hospitalized paediatric CDI.

Methods: A one-year retrospective study among paediatric patients who admitted to paediatric wards inclusion criteria 200 subjects from 2 to 14 years of age, between January December 2015. Admitted with diarrhoea and met one or more of these additional criteria such as receiving antibiotic for at least 48 hours in the 60 days prior to CDI, Prolonged hospitalization, Receiving Proton pump inhibitors, H2 blockers, chemotherapy at least three days prior CDI, or having Enteral feeding. Exclusion criteria the subjects were excluded if the records were incomplete especially on primary and secondary outcome variables such as C. difficile colonization or community acquired CDI. Qualitative and quantitative data values were expressed as frequency (percentage) and mean ± SD with median and range. Descriptive statistics were used to summarize demographic and all other clinical characteristics of the participants. The primary outcome variable, which is the incidence of C. difficile infection, qualitative and Quantitative were analysed using Chi-square test and unpaired T tests. Univariate and multivariate logistic regression methods were used to assess the predictive

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
values of each probable predictor or risk factor associated with CDI. A two-sided p value less than 0.05 was considered to be statistically significant. All statistical analyses were done using statistical packages SPSS 22. Ethical considerations the research proposal was approved by the ethical review committee Hamad Medical Corporation in Qatar.

**Results:** During this period, 23 inpatient cases were diagnosed with hospital-acquired CDI. The incidence was 5.9 per 1000 inpatient admission cases in 2015. The incidence percent of Antibiotics exposure (22.5, 95% CI 15, 38.7, P-value < 0.001), prolonged hospitalization (28.9, 95% CI 17.1, 43.3, P-value < 0.001), and enteral feeding (33.3, 95% CI 15.9, 55.1, P-value 0.001) were significantly risk factors for CDI. P value < 0.05 was considered to be statistically significant. Logistic regression analysis revealed that antibiotic exposure (OR 4.8, 95% CI 1.9, 11.7), prolonged hospitalization (OR 5.9, 95% CI 2.4, 14.6), and enteral feeding (OR 5.1, 95% CI 1.8, 14.4) were common risk factors and significantly associated with an increased risk for CDI. Outcomes of the treatment were 17 (74%) cases cured and 6 (26%) recurrent infections, with no treatment failure. Metronidazole was administered in 22 cases, of which 16 (72.7%) were cured and 6 (27.3%) cases had a recurrent infection. The mean treatment duration for metronidazole (± SD) was (12.9±1.8).

**Conclusion:** The incidence of hospital-acquired CDI is increasing among paediatric inpatients in HGH in Qatar. Antibiotic exposure, prolonged hospitalization, and enteral feeding are significant risk factors for CDI. Further prospective studies are needed to identify other risk factors for CDI.
Submission Category: Pediatrics

Session-Board Number: 4-120

Poster Title: Implementation of digital health tool for medication education following pediatric liver transplantation

Primary Author: Casey Moore, Seattle Children's Hospital; Email: casey.moore@seattlechildrens.org

Additional Author(s):
Shiho Fukasawa
Thomas Nemeth
Jennifer Pak
Hyacinth Wilson

Purpose: Solid organ transplant patients are on complex medication regimens that require strict adherence in order for the patient to have a successful graft. Patients and caregivers historically received didactic medication education at Seattle Children’s Hospital by a pharmacist inpatient post-transplant. In order for patients and caregivers to obtain medication information more efficiently with in a digital age, a medication teaching application was designed by the digital health team and the solid organ transplant pharmacists to be used for patient/caregiver education. The intention is that this tool will decrease patient and/or caregiver anxiety surrounding their medication regimen and improve adherence.

Methods: Seattle Children’s Hospital digital health team paired with the solid organ transplant pharmacists to write content and design an interactive medication education tool for patients and caregivers who have received a liver transplant. Tonic Health, a customizable web and application based digital health tool, was used. Seattle Children's Tonic Health tool contains 14 modules about preventing rejecting, tacrolimus and other commonly used immunosuppression medications, medication infection prevention, aspirin and supplements. The modules also include drug and food interactions information, how to give medications, how to prepare for home (using a pill box, phone alarms, calendars, etc), how to read prescription labels and call in prescription refills. The modules enhance the pharmacist's didactic teaching with peer -to- peer messages, self assessments and interactive media. Following liver transplantation, families are loaned an iPad and iPad charger while inpatient for solid organ transplant pharmacy teaching using the Tonic Health tool. Caregivers not in the hospital are able to access education asynchronously by downloading the application or using web links. Patients and families are

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
given a pre- and post- digital health tool surveys to assess anxiety related to their solid organ transplant medication regimen. Survey results were collected from April 2015 to April 2017.

Results: Patient and families enjoyed the education tool as evident through their feedback. They seem empowered when they come to teaching sessions with the solid organ transplant pharmacists. They know background information about the medications and the medications do not seem foreign which can lead to increased engagement, discussion and questions. Based on the pre- digital health medication tool the average anxiety score on a scale of 1 - 10 was 4.4 with 77 completed responses. Based on the post- digital health medication tool the average anxiety score on a scale 1 -10 was 2.3 with 38 completed responses. Unfortunately, the amount of modules completed decreases as the patient or caregiver completes the education with 82 completing module 1 and only 31 completing module 14. However, based on post-digital health medication tool assessments, majority of patients or caregivers (> 79% n = 34) agreed that they felt more in control of their child’s condition after using this tool, they thought It would be useful to themselves and/or family after leaving the hospital, they planned on sharing the education tool with other caregivers, and they felt more confident asking providers and pharmacists questions about caring for their child.

Conclusion: Medication education is vital for solid organ transplant patients to be successful post-transplant. Digital health is a great way to engage patients and caregivers to learn about their medications. It is adaptable to the need of the individual, department or institution and convenient as it can be completed at the individual’s own pace. The tool also provides feedback about the user’s level of understanding and augments in person medication teaching by supplementation and accessibility. Improving medication regimen education and understanding may decrease allograft rejection secondary to medication non-adherence. Measuring rejection rates and adherence in the future is needed.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pediatrics

Session-Board Number: 4-121

Poster Title: Transient neonatal diabetes management with subcutaneous insulin pump in a preterm infant

Primary Author: Julia Muzzy Williamson, North Dakota State University; Email: julia.muzzy615@gmail.com

Additional Author(s):
Brenda Thurlow
Mohamed Mohamed
Luis Casas

Purpose: Neonatal hyperglycemia is not uncommon in premature infants due to immaturity of the endocrine system. However, regulation of blood glucose often is developed after the first week or two of life without the need of exogenous insulin sources. Permanent and transient neonatal diabetes mellitus are much less common conditions usually resulting from genetic mutations. These conditions require insulin supplementation to maintain normal blood glucose and data are limited in the management especially in infants less than 1000 grams. In this case, a 23 weeks gestational age 520 gram female was born via caesarian section. High blood glucose levels were noted on day of life 3 up to 180 mg/dL and peaked on day of life 9 at 250 mg/dL despite conservative glucose infusion rates. Insulin therapy was started on day 8 of life initially at 0.02 units/kg/hr and escalated up to 0.14 units/kg/hr during the first day of therapy. For the next month she required continuous insulin infusion with regular insulin at a basal rate averaging 0.08 units/kg/hr (range 0 to 0.14 units/kg/hr). Blood glucose fluctuated significantly in relation to IV tubing changes despite appropriate priming procedures resulting in weeks of hourly to every two hour blood glucose checks and significant glucose level variability throughout a 24 hour period. As a result of labile glucose levels, the medical team decided to implement the use of a subcutaneous insulin pump on day 44 of life. The Medtronic 630G was used to provide diluted regular insulin (25 units/mL) with insertion site rotation every three days and tubing and reservoir changed daily. The initial insertion site was the buttock and the initial insulin rate was set at 0.0625 units/hr (0.08 units/kg/hr). The next day the rate was changed to 0.0625 units/hr for 3 hrs, off 1 hr to match feeds due to episodes of hypoglycemia. On the 3rd day, the regimen was again changed to 0.0625 units/hr on every other hour. After the first week, her blood glucose stabilized on this regimen with a majority of blood glucose levels between 70 and 120 mg/dL, and glucose monitoring was decreased to 4 to 6 times a day.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
After about 3 weeks, the insulin pump had to be paused and then discontinued due to low blood glucose. After the discontinuation of the pump, the patient no longer required supplemental insulin and was euglycemic. Genetic sequencing was performed for the genes known to cause neonatal diabetes; however none of the known mutations were identified. Patient was discharged at 121 days of life without any further episodes of hyperglycemia. The subcutaneous insulin pump was used successfully in this preterm neonate with transient neonatal diabetes. The use of this insulin delivery method resulted in decreased blood glucose checks, discontinuation of central line access, and overall better patient care. The patient experienced minimal adverse effects including some hypoglycemia during initiation of the pump and then towards the end of therapy.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pharmacokinetics

Session-Board Number: 4-122

Poster Title: Simultaneous determination ofitraconazole and its major metabolites in human plasma using an LC-MS/MS and its clinical application

Primary Author: Yumi Imoto, Hamamatsu University School of Medicine; Email: yimoto@hammed.ac.jp

Additional Author(s):
Takafumi Naito
Takaaki Ono
Junichi Kawakami

Purpose: Itraconazole (ITZ), a triazole antifungal agent, is commonly used for the treatment and prevention of antifungal infectious diseases. ITZ is metabolized to hydroxy-ITZ (OH-ITZ) by hepatic cytochrome P450 (CYP) 3A4. Via the CYP3A4, OH-ITZ is converted to keto-ITZ (KT-ITZ), and then KT-ITZ is further to N-desalkyl ITZ (ND-ITZ). This study aimed to develop a validated method of a liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) for simultaneous determination of ITZ and its major metabolites in human plasma and to apply it to clinical settings.

Methods: Deproteinized plasma specimens with acetonitrile were separated using a 3-µm particle size octadecylsilyl column with isocratic elution using a mobile phase of 57:43 (v/v) mixture of acetonitrile and 5 mM ammonium acetate (pH 6.0). The flow rate was 0.2 mL/min at the column temperature 40 degrees Celsius. Each analyte was detected in multiple reaction monitoring using a triple quadrupole mass spectrometer with electrospray positive ionization. The m/z of the precursor and product ions for the analytes was as follows: ITZ, 706.05/393.05; OH-ITZ, 721.15/408.15; KT-ITZ, 719.10/406.10; ND-ITZ, 649.10/376.15; and d9-ITZ as internal standard (IS), 714.25/401.15. This method was applied to the determination of plasma samples in 10 blood cancer patients treated with oral solution of ITZ. The study protocol was approved by the Ethics Committee of Hamamatsu University School of Medicine.

Results: ITZ, OH-ITZ, KT-ITZ, ND-ITZ, and IS were eluted at 7.9, 3.5, 4.6, 2.6, and 7.5 minutes, respectively with a total run time of 10 minutes. No peaks interfering with analytes and IS were observed. The calibration curves in human plasma of ITZ, OH-ITZ, KT-ITZ, and ND-ITZ were linear over the concentration ranges of 15-1500, 15-1500, 1-100, and 1-100 ng/mL, respectively. The

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
lower limits of quantification of ITZ, OH-ITZ, KT-ITZ, and ND-ITZ were 15, 15, 1, and 1 ng/mL, respectively. Their pretreatment recovery rates and matrix factors were more than 85 percent. The intra- and inter-assay precisions and accuracies were within 15 percent and 85-115 percent for all analytes, respectively. The results obtained with the present method met the standards of the international guidance. The ranges of plasma concentrations of ITZ, OH-ITZ, KT-ITZ, and ND-ITZ in blood cancer patients were 24.3-738, 33.6-1024, 2.80-59.6, and 8.41-60.1 ng/mL, respectively.

**Conclusion:** This study developed a validated LC-MS/MS method for simultaneous determination of ITZ and its major metabolites in human plasma. The present method with acceptable analytical performance can be helpful for evaluating the plasma concentration of ITZ and its metabolites in blood cancer patients treated with oral solution in clinical settings.
Submission Category: Pharmacokinetics

Session-Board Number: 4-123

Poster Title: Monte Carlo analysis of meropenem-vaborbactam compared to meropenem alone against various Enterobacteriaceae spp.

Primary Author: Joshua Knight, South Carolina College of Pharmacy - MUSC campus; Email: knightjo@musc.edu

Additional Author(s):
Roger White

Purpose: The new beta-lactamase inhibitor, vaborbactam (VAB), combined with meropenem (MER) is currently in Phase 3 (P3) clinical trials. This Monte Carlo analysis (MCA) assessed the pharmacodynamic (PD) profiles of the meropenem-vaborbactam combination (MER-VAB) compared to MER against wild-type (WT) populations of E. coli and K. pneumoniae, carbapenemase-producing Enterobacteriaceae (CBN-ENT) and KPC-producing Enterobacteriaceae (KPC-ENT).

Methods: MCA (n=10,000), using PK parameters, recent MICs, and PD targets from peer-reviewed literature, and an inpatient CrCl distribution (10 - 120 ml/min) from our institution was performed for product label (PL) dosing for MER (1g q8h over 0.5 hr for normal CrCl) and MER-VAB (1g/1g q8h over 3 hr for normal CrCl). For both drugs, regimens were adjusted for CrCl per the product label (PL) dosing scheme for MER. MCA was performed using volumes of distribution of 0.22 (normal patients) and 0.34 L/Kg (critically ill patients). Target attainment (TA%) for PD targets of fT>MIC (%) - 20, 40, and 60 was assessed.

Results: TA% for MER-VAB was - 90% for all PD targets and organisms. For MER, TA% was - 90% for all PD targets for WT E. coli and WT K. pneumoniae, however, for the resistant populations, MER TA% was much lower. For CBN-ENT, MER TA% at 20, 40, and 60 fT>MIC (%) was 55%, 31%, and 23%, respectively. For KPC-ENT, MER TA% at 20, 40, and 60 fT>MIC (%) was 57%, 32%, and 11%, respectively. The addition of vaborbactam increased %TA at all PD targets to - 98% against CBN-ENT and KPC-ENT compared to MER. TA% was similar for normal and critically ill patient volumes (difference ≤ 1.25%). Differences in TA% due to the length of the infusion were small and variable (difference ≤ 9%), where the extended infusion generally increased the %TA for 60% fT>MIC and decreased %TA at the 20% goal. No consistent differences based on volume of distribution or infusion time were observed at the 40% goal.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Conclusion: MER alone maintains good activity against wild-type populations of E. coli and K. pneumoniae and appears to still be a viable option for empiric coverage for Enterobacteriaceae. However, with populations of resistant organisms, the addition of VAB results in significant improvement in potential efficacy.
Submission Category: Pharmacokinetics

Session-Board Number: 4-124

Poster Title: Monte Carlo analysis of aztreonam-avibactam and ceftazidime-avibactam against wild-type and carbapenem-resistant gram-negative pathogens

Primary Author: Aaron Smith, MUSC; Email: smithaar@musc.edu

Additional Author (s):
Roger White

Purpose: The new beta-lactamase inhibitor, avibactam (AVI), which has inhibitory activity against a wider spectrum of beta-lactamase enzymes than its predecessors, has been recently combined with the cephalosporin ceftazidime (CAZ) as CAZ-AVI. AVI is also currently being investigated in Phase 2 clinical trials with the monobactam aztreonam (ATM) as ATM-AVI. Both drug combinations display some similarities in coverage due to avibactam’s inhibition of a variety of beta-lactamases that provide resistance mechanisms for many highly-resistant Gram-negative organisms, but differences also exist. Monte Carlo Analysis (MCA) was used to assess each combination’s pharmacodynamic profile for potential efficacy.

Methods: MCA (n=10,000) was performed for both ATM-AVI and CAZ-AVI utilizing pharmacokinetic parameters, pharmacodynamic (PD) targets associated with clinical efficacy, protein binding data, and recent MIC data from peer-reviewed literature. To enable the most direct comparison, only MIC studies that directly evaluated both combinations were evaluated. An inpatient creatinine clearance (CrCl) distribution from our institution (range: 10-120 ml/min) was used to assess clearance of each drug utilizing a CrCl vs. Clearance regression. For CAZ-AVI, the product label dosing (PL: 2g q8h 2h, infusion for normal CrCl), and ATM-AVI dosing based on phase 1 and 2 trials (CT: 1.5g q6h, 3h infusion for normal CrCl) were used in the analysis. For CAZ-AVI, dose regimens were adjusted for CrCl per the product label. For ATM-AVI, dose regimens were adjusted for CrCl per the CT protocol. MCA was performed using two volumes of distribution reflective of a normal volume (ATM: 0.17 L/kg, CAZ: 0.21 L/kg) and a volume reflective of patients (ATM: 0.30 L/kg; CAZI: 0.32 L/kg). Target Attainment (TA) for %fT>MIC-40 was used for both drugs as a low PD target. The high PD target for ATM-AVI and CAZ-AVI were %fT>MIC-60 and %fT>MIC-70, respectively. The 5 organisms studied included wild-type P. aeruginosa (WT-PA), wild-type E. coli (WT-E. coli), carbapenem-resistant E. cloacae (CR-E. clo), carbapenemase-producing K. pneumoniae (CP-KP), and metallo beta-lactamase producing Enterobacteriaceae (MBL-ENT).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** TA for both ATM-AVI and CAZ-AVI was 100% for both PD targets at both the normal and patient volumes for WT-E. coli, CR-E. clo, and CP-KP. Differences between the two combination products were found for WT-PA and MBL-ENT. CAZ-AVI had 100% TA at both PD targets for both volumes for WT-PA. In contrast, ATM-AVI had 75-78% TA for both targets and both volumes for WT-PA. For MBL-ENT, ATM-AVI had 100% target attainment for the low target and 99% target attainment for the high target at both volumes analyzed. However, CAZ-AVI had very low TA (3-5%) for all targets and volumes MBL-ENT. In contrast to what one would expect, increasing volume only minimally affected TA, with differences ≤ 4% for all targets and organisms.

**Conclusion:** As resistance mechanisms such as Klebsiella producing carbapenemases (KPCs) and metallo beta-lactamases (MBLs) become more prevalent, it will be important for the clinician to understand the differences in agents that can be used to effectively treat these resistant organisms. CAZ-AVI displayed high TA for most Gram-negative pathogens studied, however, as MBLs grow in frequency, CAZ-AVI will become a less viable candidate for empiric therapy. In contrast, ATM-AVI had high TA for the highly-resistant organisms studied and lower TA for WT-PA. Thus, ATM-AVI may be less useful when P. aeruginosa infection is suspected to be the cause of infection.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-125

Poster Title: Quality and nature of adverse drug reactions at a tertiary care obstetrics setting in Qatar: study using VIGIgrade and VIGIbase tools

Primary Author: Moza Al Hail, Hamad Medical Corporation; Email: malpharma2016@gmail.com

Additional Author (s):
Binny Thomas
Pallivalappila Abdulrouf
Wessam Elkassem

Purpose: Medication use during pregnancy appears to be almost ubiquitous and inimitably challenging. Most of the studies on Adverse Drug Reactions (ADRs) focused on general population and pediatrics whilst adverse reaction to medications among pregnant women is relatively unknown, hence there is an urgent need to assess the prevalence of such unwanted, obnoxious events among this specialized population. The aim of this study was to determine the frequency, quality of reports, nature and causality of ADRs reported at an obstetric tertiary care teaching hospital in Qatar.

Methods: A retrospective study of review of ADRs spontaneously reported by healthcare professionals at Women’s Hospital. Women’s Hospital is the largest tertiary care obstetric setting in Qatar (320 bedded), stratified into obstetric wards, one gynecology ward, two high dependency units (for critical patients), and six postnatal wards. The study collected data over four years from January 2013 - December 2016. All ADR reports submitted both paper based and electronically were reviewed and only the completed ones were included in the study. The study assessed the quality of the ADR reports using VIGIgrade tool (data completeness tool adapted from Uppsala monitoring center in Sweden) and Grading for Quality of Documentation (WHO). The nature of ADR reports were also assessed that included, drugs causing ADRs, system organ involved in ADRs, and several scales were used to assess Causality (Naranjo scale), severity using Hartwig Severity scale and Preventability using Schumocks and Thornton scale. The main outcome measures were proportion of ADRs reported, and the proportion of them being preventable and harmful.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: In total 187 ADRs were submitted, of which only 133 were included in the final study. Majority (34%) of the ADRs occurred among patients aged 31-40 age group. Antibiotics were the most common class of drugs involved (39%), followed by anti-inflammatory agents (9%), followed by gastrointestinal drugs (7%). Skin and subcutaneous tissues disorders were the most commonly effected organ system accounting approximately 56%, followed by respiratory system (19%) and gastrointestinal (11%). Rash pruritis (28%) was the most common reaction reported followed by dispnoea (14%) and vomiting (12%). Majority of the patients recovered from the ADRs (73%) while only less than 2% continued the reaction at the time of the reporting. Approximately 84% of the reactions were mild in severity while approximately 2% caused severe harm to the patient. Although majority of the reports were non preventable approximately 19% of them caused temporary harm that required monitoring, treatment or even prolonged hospitalization. Majority of the reports were categorized as possible (52%) according to Naranjo Causality scale. According to the vigigrade analyses of completeness of data the study achieved a score of 0.74 which demonstrates good quality of reporting.

Conclusion: The study confirms that antibiotics were most common drugs causing ADRs, and majority of ADRs were not preventable while some of them caused extensive human suffering and that included treatment and hospitalization. The study also assured that the reporting process at Hamad Medical Corporation is of good quality although the number of reports were very low.
Submission Category: Safety / Quality

Session-Board Number: 4-126

Poster Title: Improving patients satisfaction with outpatient pharmacy services at tertiary care hospital in Saudi Arabia

Primary Author: Ali Al-Blowi, King Fahd Armed Forces Hospital; Email: blowi@hotmail.com

Additional Author(s):
Hala AlButi
Abdulnasser Alzahrani
Mohammad Alqarni
Adil Almalki

Purpose: Patient satisfaction is an important metric for continuous quality improvement in the delivery of health care services. Although studies measuring patient satisfaction with pharmacy services are numerous, local studies in Saudi Arabia are limited. The aim of this study was to measure patients' satisfaction with pharmaceutical care services before and after implementation of new patient-centric services. Interventions concentrated on redesigning and expanding the space of pharmacy, specifically adding more windows and increasing the number of pharmacist allocated for each window. These interventions were designed to decrease waiting time while improving efficiency, caring, convenience and patient satisfaction with pharmacy services.

Methods: This pre-post interventional study was carried out in the outpatient pharmacy of King Fahd Armed Forces Hospital (KFAFH), a 700-bed capacity tertiary referral hospital in Jeddah, Saudi Arabia. The aim of this study was to measure patients' satisfaction (using a survey) with pharmaceutical care services before and after improving the quality of the services provided. Those who were Arabic speaking citizen, aging 25 years or more, knew how to write, were taking one or more prescription drug, and competent for interview were included. The survey was a 5-point Likert response scale developed based on standard questionnaire and encompasses 6 dimensions: general satisfaction, caring, efficiency, waiting time, convenience, and one open question for any patient comments or complaints that the patient would like to express. Prior to implementation of expanded number of dispensing windows and pharmacists, a cross-sectional survey using self-administered questionnaire that examines the patients' satisfaction and assesses the outpatient pharmaceutical services provided was distributed randomly to a cohort of 200 patients (baseline). After implementing the above interventions,
satisfaction was measured again with another 200 patients. The baseline responses were used as control for comparison to the post-intervention (study) responses.

**Results:** After implantation of an expanded number of counselling windows and pharmacists, patient satisfaction with outpatient pharmacy services was improved significantly ($p < 0.001$) in all domains measured. Overall satisfaction increased significantly in the study group, with a mean difference of -2.34 (95% CI: -2.46, -2.22) ($p < 0.001$) compared to the control group. The domain most impacted was improvement in waiting time. Concern for the lack of availability of some pharmacy items was noted.

**Conclusion:** In KFAFH hospital in Jeddah Saudi Arabia, implementation of expanded number of dispensing windows and pharmacist significantly improved overall patient satisfaction, especially because of reductions in waiting times.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-127

Poster Title: Prescribing errors in a family medicine practice of a major hospital in Saudi Arabia

Primary Author: Mohammed Aljamal, King Salman Military Hospital; Email: mmaljamal@hotmail.com

Purpose: The purpose of this study was to improve the prescribing quality of drugs in family medicine practice through assessment for the different types and frequency of prescription errors.

Methods: A retrospective study of all available prescriptions (No. 1017) during the period of the study (5 days of the month, one different day every week. All prescriptions for that day was collected including fast track and chronic disease clinics medications) was carried out. These prescriptions were examined according to the ideal prescription writing mentioned in the literature and standard practice. Descriptive analysis was used.

Results: About 75% of the prescriptions were dated. The patient name and medical number become found in 99.9% and 99.5% of the prescriptions respectively. The gender and age of patients had been referred to in 61.8% and 57.2% of the prescriptions respectively. The diagnosis and weight of the patient become observed in 21% and 11.7% of the patients. Medication information including name (both generic or brand) of the drug turned into observed in a 100% of the prescriptions whilst generic name was found only in 36.6% of the prescriptions. Dosage form, route of the drug, strength frequency and duration of treatment became found in 56%, 21.6%, 69%, 86.2% and 75% respectively. Stamp, signature and bleep range of the prescriber is cited in 99.5 %, 61.9% and 53.3% of the prescriptions. Almost 99.5% of the prescriptions were incomplete. The overall prescription errors was 38%.

Conclusion: Prescription hand writing errors are the main source of occurrence of medication errors. The occurrence of prescription error is found to be high. There is a more need to train the physicians about how to write a prescription completely which in turn will increase the patient benefits and less medication errors. It was recommended to use electronic prescribing which was achieved with 100% within six months. this impact on quality and safety of prescribing and could minimise medication errors.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-128

Poster Title: Development of assessment of risk tool for safe handling of hazardous drugs

Primary Author: Jeffrey Blunt, Barnes-Jewish Hospital; Email: jeffrey.blunt@bjc.org

Additional Author (s):
Dorothy Hancock
Anthony Kessels
Patsy Stapleton
Emma Hooks

Purpose: Our organization’s goal is to ensure overall safety of employees, patients and visitors through proper handling of hazardous drugs. USP 800 allows for the assessment of exposure risk in handling hazardous drugs from NIOSH Table 1 with certain formulations and drugs on Tables 2 and 3. We identified the assessment as a complicated process requiring input from multiple disciplines. This project was designed to develop a tool to assess hazardous drug risk by dosage form and packaging used, handling and manipulation during each process step involved, personnel affected, engineering controls and personal protective equipment (PPE) required and containment strategies needed.

Methods: A multi-disciplinary team consisting of the departments of pharmacy, nursing, materials management and environmental health and safety was formed. The team also included an industrial hygienist. Documents from USP 800 and NIOSH 2016 were thoroughly reviewed. Seven commonly used drugs from NIOSH Tables 2 and 3 were evaluated initially. Each formulation and packaging of each drug was evaluated separately. Each step of handling and manipulating a hazardous drug by any employee was identified. Using guidelines from NIOSH 2016 and USP 800 an exposure rating was assigned to each step which determined PPE requirements. From these activities, an assessment tool was developed to determine the appropriate handling of these seven drugs. The team later applied this assessment tool to the remaining drugs in NIOSH tables 1, 2 and 3 to determine if any appropriate alternative containment strategies or alternative work practices could be implemented.

Results: Our results include: 1) a hazardous drug list; 2) database defining drug dosage forms and packaging, exposure risk, handling and manipulation process steps, engineering controls and PPE needed; 3) an assessment tool for new and investigational drugs; 4) hazardous drug

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
policy and procedure; and 5) an implementation check list. An exposure rating was developed which defined risk as little to no exposure risk, moderate risk, elevated risk and high risk. Steps identified in the handling and manipulation processes included receiving, stocking, preparation, dispensing, loading and unloading for transport, transporting to the patient care area, accessing automated dispensing machines, administration, disposal, handling excreta and uncontrolled release. Each step in the handling and manipulation process was analyzed for each formulation. Engineering controls and PPE requirements were determined for each step. Exemptions to USP 800 and NIOSH 2016 were discussed and reviewed by the team. The assessment tool was adapted to determine hazardous status of new drugs and investigational drugs. The term hazardous will be used instead of chemotherapy whenever possible in policies, training and labeling to reinforce the concept that all of these drugs require special handling.

**Conclusion:** Assessment of the exposure risk of each step of handling hazardous drugs was completed by a multi-disciplinary team. The database created by this team provides a list of hazardous drugs and details about the exposure risk, engineering controls and PPE required at each handling and manipulation step. The hazardous drug policy and implementation check list are based on this database. The assessment tool developed is now used to determine the hazardous status of new drugs and investigational drugs.
Submission Category: Safety / Quality

Session-Board Number: 4-129

Poster Title: Identifying and implementing procedures for improving glycemic control

Primary Author: Joseph Botticelli, Cardinal Health; Email: joseph.botticelli@cardinalhealth.com

Additional Author (s):
Meredith Ve'leze-Mercado
Shawn Guillory

Purpose: Pharmacy is accountable for leading the effort to reduce or eliminate adverse drug reactions (ADR). Over the past twelve months, ninety-two (92) preventable ADRs were identified. Of those, fifty-three (53, 57.6%) were problems with glycemic control. These results placed this category of ADR as the most significant. A multidisciplinary group of clinicians representing nursing, risk, diabetes educators, education, medical staff and pharmacy performed a failure mode and effects analysis (FMEA), identified a series of process changes, obtained approvals and implemented them with the goal of reducing this number.

Methods: The FMEA team took a proactive approach by identifying potential failure modes and their effects on patient care. Using the medication use process, the team reviewed and evaluated the prescribing, transcribing, dispensing, administration and monitoring processes in place for addressing hypo and hyperglycemia. The various steps in each process were broken down and flow diagrams created to facilitate identification of areas where failures most commonly occurred. They then compared evidence-based practice to current practice by reviewing current medical, nursing and pharmacy literature outlining best practices and matching them against actual procedures in place in the hospital. A series of recommendations for improvements were developed, such as order sets, protocols, guidelines, and procedures. These were presented to the hospital’s administrative and clinical leadership for approval, including the Quality and Safety Oversight Committee, Pharmacy, Therapeutics and Dietetics Committee and Medical Executive Committee. Finally, the team used a multifaceted approach to implementing the various procedural improvements throughout the institution. As education was key to success, a power point presentation was developed for medical, nursing and pharmacy staff which provided clinical information on diabetes, hypo and hyperglycemia, methods for monitoring outcomes, updated procedures for distribution and administration of insulin and the new order sets and protocols for initiating therapy.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: The following improvements in glycemic control were implemented; clinical staff (medical, nursing, pharmacy) were educated regarding the identification and treatment of diabetes, hypo and hyperglycemia; basal-bolus with correctional dosing methodology was established as the primary means of treatment - no longer would sliding scale insulin orders be accepted as the sole means of treating diabetes; the insulin formulary was streamlined to include a single long, short and intermediate acting product with regular insulin used strictly for intravenous infusions and treatment of hyperkalemia - combination, same acting alternatives and concentrated insulin products were removed from formulary; a single hard copy and electronic order set for basal-bolus and correctional dosing and protocols addressing insulin infusions and hypoglycemia treatment were updated to facilitate the new procedures; obsolete and redundant order sets and protocols were removed from the hospital’s library; and a process for the safe dispensing and administration of insulin was established. A recommendation to require the use of computerized physician order entry (CPOE) for these clinical conditions was met with resistance and was not approved for implementation.

Conclusion: The use of FMEA procedures was effective in identifying the areas in the medication use process that most often led to ADRs in glycemic control. The multidisciplinary team of clinicians was able to develop a substantial number of procedural improvements based on evidence-based practice and successfully obtained administrative and medical staff approvals. The multifaceted implementation plan addressed clinical and operational procedures and practitioners throughout the institution. The monitoring of preventable ADRs continues to determine the success of these improvements.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Safety / Quality

**Session-Board Number:** 4-130

**Poster Title:** Medication side effect counseling impact on patient satisfaction and healthcare consumer assessment of healthcare providers and systems scores: An evolving role for nurses and pharmacists

**Primary Author:** Kevin Brandon, Kenmore Mercy Hospital; **Email:** kbrandon@chsbuffalo.org

**Additional Author(s):**

**Purpose:** To implement more effective pharmacy and nursing-specific communication strategies regarding medication side effect counseling using an interdisciplinary approach in order to improve patient satisfaction and experience, increase the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores, and decrease hospital readmission rates.

**Methods:** During a four year period multiple methods were developed and implemented to positively impact medication side effect counseling. Prior to development of the pharmacy initiated program the hospital was consistently underachieving in specific areas such as the HCAHPS key driver question “staff described medication side effects”. The first initiative was to expand staff education that reinforced proper patient counseling techniques and emphasize the important role that the hospital staff plays in the proper and effective communication of medication side effect information to the patient. Focused efforts were then placed in the development of new and improved patient education resources that specifically highlight medication side effect information. Development of pharmacy and nursing staff resources also played an integral role in improving medication side effect counseling. The pharmacy department developed and implemented readily available nursing reference sheets and also work directly with the information technology department to have daily staff reminders appear on screen savers and also have the most common side effects automatically appear on the electronic medication administration record on the patient profile. Other initiatives included the pharmacy department developing daily reports which identify counseling opportunities within the institution and holding staff members accountable daily for achieving a minimal number of patient counseling interactions per day for these targeted patients.

**Results:** Since implementing the strategies initiated by the pharmacy department, the hospital has seen positive results in key areas of focus that helped to impact and increase the patients...
overall experience during their stay in the hospital. The overall number of patient medication counseling interactions by the pharmacist per day has increased considerably from 2013 through 2016. A steady improvement has been seen in the HCAHPS scores for the key driver question “staff described medication side effects” from 2013 through 2016. Through improved focused and collaboration of all departments the overall patient satisfaction and experience within the hospital has risen from below the national average in 2013, to well above the national average in 2016.

**Conclusion:** Since studies have found that side effects counseling positively impacts patient satisfaction and experience, which in turn positively impacts hospital quality scores and readmission rates, this was identified as a key target for improvement at our institution. From 2013 to the present date, several strategies have been implemented by the pharmacy department in the hospital to get not only the pharmacy, but also the nursing staff more involved in medication side effect counseling. The efforts set forth by the pharmacy department and carried out by pharmacy and nursing staff to improve medication side effect counseling has helped to impact the increase of overall HCAHPS scores and overall patient satisfaction within our institution, thus positively affecting ratings which determine reimbursement through Centers for Medicare and Medicaid Services (CMS).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-131

Poster Title: Utilizing comprehensive, retrospective electronic medical record (EMR) audits to enhance concurrent medication use surveillance.

Primary Author: Jennifer Brandt, Chesapeake Regional Medical Center; Email: jennifer.brandt@chesapeakeregional.com

Additional Author(s):
Daniel Ostrowski
Jack Lemanowicz

Purpose: Detecting and preventing adverse drug reactions (ADR’s) and medication related errors are paramount responsibilities of all pharmacists. A lack of reporting these events has been identified as a barrier to prevention. EMR has greatly facilitated retrospective review of all medication therapies and affords ready identification of ADR’s and medication errors. Implementation of retrospective review at a 301 bed community hospital has enabled pharmacists to focus prospective surveillance systems on serious or preventable adverse events.

Methods: The night shift pharmacist was assigned to review the electronic medical records of all patients admitted during the month. This included inspection of patients’ history, emergency room notes, admitting medication reconciliation, physician progress notes, anesthesia log, nursing notes, physical therapy notes, nutrition notes and discharge summary. Next, a report was generated to identify all patients admitted within the month who received a “tracer drug” including, but not limited to, Dextrose 50%, atropine, benztrpine, naloxone, epinephrine, KCentra, vitamin K, flumazenil and sodium polystyrene sulfonate. A file was generated to include patient name, medical record number, date, drug involved, reaction, severity level, treatment ordered and patient outcome. Patients who developed acute renal failure while receiving Vancomycin and piperacillin/tazobactam were identified and reported monthly. Tolvaptan use was also evaluated monthly due the availability of safer and less expensive alternative medications. A report to identify lost pulmonary inhalers was created and reported monthly to nurse leadership, respiratory therapy, and the medical staff.

Results: Since beginning in June 2016, the retrospective chart review has yielded an average of 151 adverse drug reactions. Some of these were due to avoidable medication errors.
Additionally, the effort has identified 145 patients who were readmitted within 30 days due to these adverse drug events. Pharmacy administration has proposed funding for a pharmacist position in the emergency room to complete medication reconciliation for admitted patients. Staff realignment is planned to include pharmacist review of discharge medications. Serious adverse events involving gabapentin have led to prospective review by clinical pharmacists and several serious events involving warfarin led to pharmacist re-education on anticoagulation. Cases of Vancomycin/piperacillin/tazobactam nephrotoxicity were identified, resulting in enhanced monitoring of renal function and pharmacist and provider education. Monitoring of tolvaptan uncovered frequent use by two providers and many of these patients were also receiving medications known to lower serum sodium (i.e. SSRI’s, diuretics). Provider education has yielded a significant reduction in tolvaptan use. Reports indicating the number of lost inhalers with associated cost were presented to respiratory therapy, pulmonologists and the P&T Committee leading to the removal of some multi-dose inhalers from the formulary in favor of respiratory therapy administered nebulizer treatments.

**Conclusion:** Retrospective surveillance alone for identifying adverse reactions and medication errors is not preferred. When used to support a prospective surveillance system, it becomes a powerful performance improvement tool. Retrospective chart review at this community hospital is providing prospective opportunities to ensure efficacious, safe and economical medication use.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-133

Poster Title: Clinical and economic burden of drug diversion in both inpatient and ambulatory healthcare settings in the US

Primary Author: Charles Callahan, BD; Email: patrick.callahan@bd.com

Additional Author(s):
Kelly Larrabee
Brent Hale
Smeet Gala

Purpose: Of 23.9 million Americans who use illicit drugs, 6.8 million (28.5%) use prescription drugs for nonmedical purposes. In the US, the economic burden related to drug abuse was estimated at $193 billion in 2007 and opioids at $78.5 billion in 2013. Drug abuse and diversion is prevalent in healthcare settings, owing to the close proximity to drugs, stressful work environment, varied adoption of technology, and challenges with visibility of medication use and management. It is important to understand the prevalence and burden of drug diversion in healthcare settings in the US to communicate the need to prevent and reduce diversion.

Methods: A targeted literature review of studies was conducted in MEDLINE - (R), Cochrane Library and conference proceedings from ASHP Midyear and Summer Meetings. Studies published in peer-reviewed journals in English language from 2007 - 2017 and abstracts published from ASHP from 2012 - 2017 were screened. Additionally, grey literature was searched using Google for relevant white papers, newspaper articles and reports. Articles were included if they reported the prevalence of drug diversion among healthcare professionals. Additionally, articles were also included if they reported the clinical and, or economic consequences on patients, healthcare professionals or healthcare systems. Diversion related reports for settings in community pharmacy, home care and long-term care facilities or nursing homes were excluded.

Results: Rates for diverting healthcare professionals vary greatly, both by source and profession. Peer-reviewed publication reports ranged up to 15% for pharmacists, physicians, nurses and anesthesiologists (rank ordered), whereas gray literature rates ranged are as high as 30% for anesthesiologists. Commonly diverted drugs in inpatient settings are controlled substances such as hydrocodone (18%), oxycodone (17%), hydromorphone (14%), morphine...
(13%) and fentanyl (8%), and high-cost drugs. Healthcare professionals who divert drugs can compromise patient safety by either being impaired during care-giving or may give lower or no doses of drugs and introduce risk related to morbidity, mortality, or license revocation. Administration of drugs to patients via contaminated needles previously used by diverting healthcare professionals has resulted in multiple reports of hepatitis C and bacteremia outbreaks, which forced hospitals to provide patients at risk with interventional care, free of charge, and put healthcare system at risk for litigation. This adds to the hefty economic burden of loss of inventory (e.g. a pharmacy technician ordered and diverted drugs at a cost to the VA of $77,700 and a street value of $160,000) and litigation costs (e.g. $2.3 million settlement paid by a hospital to resolve diversion of pain drugs by nurses).

**Conclusion:** Drug diversion in inpatient and ambulatory healthcare settings may greatly impact patients’ and healthcare professionals’ safety, imposing a significant burden on healthcare systems. It is crucial to monitor diversion of drugs occurring for individual use and theft for resale in healthcare settings to better understand the true magnitude of burden. Simultaneously, it is critical to place strategies to detect and curb diversion among healthcare professionals. Future research and evolving technologies can provide improved visibility and traceability of drugs which can help identify diverters earlier. Additionally, education of effect of diversion may further empower healthcare professionals to jointly address this issue.
Submission Category: Safety / Quality

Session-Board Number: 4-134

Poster Title: Evaluation of the impact of a pharmacist-driven termination protocol to limit inappropriate use of acid suppressive medications in the non-ICU setting

Primary Author: Christin Campbell, Ascension - Borgess; Email: christinmcampbell@gmail.com

Additional Author (s):
Tracey Mersfelder
Kevin Kavanaugh

Purpose: Overutilization of proton pump inhibitors (PPIs) and histamine-2 receptor antagonists (H2 blockers) related to stress ulcer prophylaxis (SUP) is a known and published fact. The ASHP guidelines from 1999 provided indications for SUP in the inpatient setting. Disadvantages associated with overutilization of acid suppressors include increased risk of Clostridium difficile infections and pneumonia, electrolyte and vitamin abnormalities, and drug interactions. These adverse events also create an economic burden to the healthcare system. Our study aims to evaluate the effectiveness of a pharmacist-driven termination protocol to limit inappropriate use of acid suppressive medications in the non-ICU setting.

Methods: The institutional review board granted exempt status for this quality improvement project. Patients were included if they met the following criteria: 18 years of age or older, prescribed a PPI or H2 blocker, and were admitted to the hospitalist service. Patients were excluded if the PPI or H2 blocker was a home medication or if they were admitted to the intensive care unit. Phase 1 of this study retrospectively evaluated patient charts for appropriate use of PPIs or H2 blockers and continuation of the medication upon discharge. Criteria for appropriate use of acid suppressive medications were based on the SUP guidelines and were approved by the Pharmacy and Therapeutics Committee. Phase 2 prospectively evaluated appropriate use of acid suppressive medication based on the same criteria used previously. A web-based clinical surveillance system identified patients for inclusion in the study. If medication use was deemed inappropriate, a pharmacist contacted the health care provider to discontinue the medication. The primary outcome of this study was the proportion of patients that had acid suppressive medication discontinued before and after implementation of the pharmacist-driven termination protocol. A secondary outcome evaluated if inappropriate medication(s) use continued at discharge. Outcomes were evaluated by the Fisher’s exact test. SAS v9.4 was utilized to perform statistical analysis.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: In Phase 1, one hundred thirty-one patients were evaluated. Ninety-five were excluded due to home medication use. Acid suppression medication was inappropriately prescribed in 26 patients. Of these, one patient’s medication was discontinued during the hospital stay. Nine patients were provided with a prescription for PPI or H2 blocker at discharge. In Phase 2, one hundred thirty-two patients were evaluated. One hundred thirteen were excluded due to home medication use. Inappropriate acid suppression was prescribed in nine patients, eight of which were discontinued based on the pharmacist-driven termination protocol. Only one patient was discharged with a prescription for the PPI or H2 blocker. There was a statistically significant difference (p < 0.0001) between pre- and post-intervention for inappropriate use acid suppression in the inpatient setting. There was no statistical difference regarding discharge medications (p=0.18).

Conclusion: Acid suppressive medications are over-prescribed in the hospital setting. This may lead to an increased number of adverse events. This study revealed a 6% reduction rate of inappropriately used acid suppressive medications by a pharmacist-driven protocol, which is in line with the 5% reduction rate found in a similar study. The implementation of a pharmacist-driven termination protocol may help decrease the inappropriate use of acid suppressive medications (and its sequelae) on an inpatient hospital service.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-135

Poster Title: Introduction of an electronic ordering process for parenteral nutrition (PN)

Primary Author: Maria Creed, Pharmacy Department Mater Misericordiae University Hospital; Email: mcreed@mater.ie

Additional Author (s):
Mary McKieran
Emma Baker
Laura Dillon
Ciaran Meegan

Purpose: PN is an invasive, specialised form of nutrition for the prevention or treatment of malnourishment in vulnerable patients. The MMUH is one of eight designated cancer centers in Ireland and, due to an increase in Gastrointestinal surgical specialisation, is treating greater numbers of patients requiring PN. In 2016 there has been a 47% rise in PN usage, leading to workload increase and time pressures for Pharmacists and Dietitians working on the supply processes. Our aim was to collaboratively review the PN supply process, with view to removing bottlenecks and delays.

Methods: A multidisciplinary group, including Pharmacists, Dietitians and Porter Delivery Staff, was formed. Actions arising were as follows: Brainstormed ideas to identify bottlenecks and inefficiencies in communication in the process. Determined potentials solutions which were deemed worthy of trial on an incremental basis. Collected pre- and post-intervention data between September and November 2016, on pharmacy time spent on the PN supply process. This data was circulated daily to the multidisciplinary group to engender greater understanding of each members role and actions. The group then collaboratively agreed on process redesign which data proved was beneficial to staff and patients.

Results: The original process involved Dietitians sending paper prescriptions to Pharmacy, pharmacist prescription review, pharmacist electronic order generation and pharmacy call back to the Dietitian for verification. The re-designed process enables Dietitians to directly order PN electronically for each patient, removing a number of steps from the existing process. Data analysis using Excel - (R) demonstrated a 57% reduction in PN supply time in Pharmacy, from 7 to 3 minutes per bag (mean of 100 bags / week). Pharmacist satisfaction with the reliability,
standardisation and clarity of the process improvement was high. The time reduction meant the pressure to turn around PN orders was decreased leading to lower stress levels. The Dietitians also reported improved time management and satisfaction with process update.

**Conclusion:** The introduction of a streamlined Dietitian electronic ordering process for PN has led to a saving of 400 minutes of Pharmacist time (0.18 WTE) per week. The updated process has led to the capacity to accommodate the increase in service use. Furthermore it has led to improved relations between Pharmacists and Dietitians, more time for communication on patient safety and stock management issues, and less reliance on a person-dependent manual process which previously contributed to delay and staff stress.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-136

Poster Title: Medication reconciliation: utilizing pharmacy technicians and telepharmacists improves patient care

Primary Author: Christopher Dailey, FF Thompson Hospital; Email: christopher.dailey@thompsonhealth.org

Additional Author (s):
Hong Lam

Purpose: Medication reconciliation is an important patient safety initiative. A 2 week baseline review showed that only 37 percent of admissions occurred during the pharmacy coverage period in the Emergency Department and 61 percent included a home medication list verified prior to admission orders being submitted. The issue is compounded if the pharmacy is not open around the clock. Providers may delay the admission until the home medication list is available or proceed without it, which increases the risk of medication errors. Implementing an after-hours medication reconciliation program using remote telepharmacists reduces the risks to patients being admitted to the hospital.

Methods: Three changes were initiated to help improve medication reconciliation at our hospital. First, a pharmacy technicians and interns were involved in the process. The technician gathers patient medication information from the hospital Emergency Room EMR (T-System), fill history in EPCS/Paragon or community pharmacy systems, medication bottles, primary care medication list or MAR from another facility. The technician then interviews the patient to confirm the home med list before entering it into Paragon. A pharmacist verifies the medication list for accuracy and clinical appropriateness. The technician allowed expansion of pharmacy coverage hours in the ED from 7 hours to over 15 hours M-F. Pharmacy Interns and remote telepharmacists allowed expansion of weekend coverage from 0 to 8 hours per day. Second, a pharmacist medication review is completed by a remote telepharmacist when the primary pharmacy is closed. Third, an on-site pharmacist prints a list each day of patients admitted the previous day with the goal to complete medication reconciliation for patients who did not have a medication list in a verified status. The set goal is to have medication reconciliation verification by a pharmacist of all patients within 1 calendar day of admission date. The data collection period was 6 months from September 2016 until February 2017.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: The current workflow allows pharmacy coverage in the E.D. to expand from 7 hours to 15 hours on weekdays and 8 hours per day on weekends. During the 6 month monitoring period, the percentage of medication lists verified by a pharmacist for patients admitted through the E.D. within a calendar day of admission reached 100 percent for the first time (range: 88-100; mean 96.6). The average number of medication list verifications done by the onsite hospital pharmacist was 12.3 per day during the day during the month of February 2017 and those done by a remote pharmacist was 76 per month. The number of medications that were reviewed per patient ranged from 2 medications to 28 medications (mean of 10 per patient). On average, it takes a pharmacist about 30 minutes to complete a medication history verification per patient with a range of 6 minutes to over one hour for patients with complex drug therapy or communication challenges. Pharmacist interventions included drug dose/frequency corrections, therapeutic duplications avoided, drug duration/indication and omission clarifications and drug level recommendations.

Conclusion: Patient safety was improved by having home medication therapies consistently reviewed by a pharmacist within 24 hours of admission. Including a dedicated pharmacy technician in the medication reconciliation process to collect and compile the medication lists allows a pharmacist to identify and discuss omissions, duplications of therapy and appropriateness of medications with providers. The telepharmacist involvement expanded our coverage without expanding our on-site pharmacy hours. Finally, having the on-site pharmacist complete the medication reconciliation for any remaining patients admitted within 24 hours ensures all patients are admitted with an accurate home medication list.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Safety / Quality

Session-Board Number: 4-137

Poster Title: Using automation to eliminate exposure to aerosolized powders during the compounding of oral liquids

Primary Author: Joe D'Silva, P & C Pharma; Email: joesilva@pandcpharma.com

Additional Author(s):
Karen Jones
Nay Win
Annie Schuelke
Edmund Elder

Purpose: Compounding of oral liquids from tablets, capsules, and drug substances is commonly undertaken using a mortar and pestle. The process is associated with a risk for exposing personnel to aerosolized powders. A novel automated wet-milling process was developed to contain compounds within a single-use specialized plastic container; thus, preventing exposure. This study was undertaken to investigate the elimination of aerosolization of powders during the compounding procedure.

Methods: The compounding procedure is initiated by placing tablets, capsule contents, or drug substances and water into the specialized plastic containers. The specially textured abrasive surface of the container combined with a high RPM planetary motion from a milling machine converts the contents into a fine uniform suspension. A solid mixture of viscosity enhancers, flavors, sweeteners, buffers and preservatives is employed to produce a pharmaceutically acceptable oral liquid formula. Subsequently, the container serves to store and administer the compounded product. During the wet-milling process the container is placed inside a sealed holder. Studies were conducted to investigate potential aerosolization of powders during the compounding process. Methylene blue and rifampin were selected as test compounds for their strong chromophore properties. Two conditions were evaluated: a) powders as is, and b) powders constituted into slurries in water. Native powders represent an extreme test condition while slurries represent the actual compounding procedures. After completion of the milling cycles, the container surfaces were swabbed with methanol. The swabs were tested for methylene blue via visible spectroscopy and for rifampin via high pressure liquid chromatography. Particulate burden inside the general machine space during the compounding process was measured during milling of the powder samples and compared with
data compiled when operated with no containers (or powders). Measurements were undertaken in the environment outside of the sealed holders for the containers.

**Results:** No methylene blue or rifampin was detected on the surface of the containers under both test conditions. The levels measured were below the level of detection of the assays. The analysis of the particulate levels during the compounding runs with the powders did not display any spikes and the trends were generally comparable to data compiled when operating without any containers in the holders.

**Conclusion:** The data show that the device technology allows for the compounding of oral liquids from tablets, capsules, and drug powders without any detectable aerosolization of the powders. The construction of the automated wet-milling technology fundamentally eliminates the possibility of aerosolization. Compounding with tablets provides the highest level of safety as no powders are ever involved in the compounding process. Compounding employing capsules and powders requires proper handling and care during the introduction of the powders into the containers. However, once introduced into the containers, there is no risk of subsequent aerosolization.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-138

Poster Title: Standard work implementation for total parenteral nutrition (TPN) verification and preparation

Primary Author: Ashley Duty, Children's Mercy Hospital; Email: ashleymduty@gmail.com

Purpose: Over time, many issues and inconsistencies have caused questions about TPN (total parenteral nutrition) verification and preparation in the pharmacy. These issues and inconsistencies are especially concerning given the practice is high-risk in nature. Standardized work is one of the most powerful but least used lean tools. By documenting the current best practice, standardized work forms the baseline for continuous improvement. This case study outlines the standard work approach that was used to create the operational flow, process maps, job aids, training schedules, and abnormality trackers that can be used to continuously improve any complex process in healthcare.

Methods: A two-day workshop was held between the hospital quality improvement team and pharmacy management, pharmacists, and pharmacy technicians at a free-standing, 315-bed pediatric hospital. The goal of the workshop was to teach the principles of Standard Work and use TPN verification and preparation as the example process. Participants spent the time outlining the critical safety steps and standardizing best practices for adoption. Time to complete every step was recorded and used to calculate takt, or demand, time. A process map was created for each of the seven pharmacy employees that may participate in the TPN process for each preparation. Training schedules were created with a goal to retrain every pharmacist and technician in the department efficiently. Observations were assigned to frontline employees to observe adherence to standard work and identify opportunities via abnormality trackers. Providers, nursing, and other external stakeholders were invited to hear a report of accomplishments and provide input. Feedback was also given to external stakeholders about takt time and expectations of the pharmacy department to complete the TPN process.

Results: All staff were trained according to the training plan. Overall feedback to the process of standard work was positive and could improve safety. Employees felt empowered to speak up about standard work deviations and to continuously improve the operational flow and process maps. Observations and use of abnormality trackers is ongoing. Future high-risk standard work topics identified by staff are: repackaging, non-sterile compounding, and chemotherapy preparation.
Conclusion: Standard work is an established method of workflow standardization and continuous improvement that can potentially improve safety of high-risk practices.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-139

Poster Title: An evaluation of knowledge, attitude and practice of pharmacists towards adverse drug reactions: a questionnaire based study at Hamad Medical Corporation, Qatar

Primary Author: Wessam Elkasse, Hamad Medical Corporation; Email: welkassem2016@gmail.com

Additional Author(s):
Binny Thomas
Pallivalappila Abdulrouf
Anas Hamad
Moza Al Hail

Purpose: Adverse Drug Reactions (ADRs) are major cause of morbidity and mortality among hospitalised patients. Detection of these adverse reactions are important to since it could decrease the consequences and thus reduce healthcare cost and enhance patient safety within the healthcare setting. The current study was planned to evaluate the knowledge, attitude and practice (KAP) of pharmacists towards Adverse Drug Reaction reporting at a academic healthcare centre based in Qatar. The study findings will be used to recommend interventions to develop ADR reporting culture and enhance ADR patient safety practices at HMC.

Methods: A descriptive cross sectional questionnaire based methodology was used to evaluate the knowledge, attitude and practice of pharmacists and pharmacy technicians working at HMC. The questionnaire was distributed over a period of 3 months from March until May 2017.. The questionnaire was developed using Survey monkey and piloted among 30 pharmacists for content and face validity and necessary changes were made based on their suggestions. The final questionnaire was distributed to 700 staffs (pharmacists and pharmacy technicians). The questionnaire comprised items regarding knowledge/awareness of pharmacovigilance and ADRs, perception/attitude towards pharmacovigilance and ADR reporting, and practices of ADR reporting. The questionnaire comprised of total 31 questions divided into 3 categories: section 1: demographics and practice characteristics (18 questions), Section II: Attitude and belief of participants towards ADR reporting (1) and final section was on Knowledge Levels (11). Descriptive statistics were used to analyse the data.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: A total of 700 questionnaires were distributed to the pharmacists and technicians and 272 participants responded, providing a response rate of 39%. In our study, 52% respondents were males and 48% were female pharmacists, of all the participants answering the questionnaire, 31% were MSc, 12% were PharmD, 29% had BSc.Pharm, 0.4% were PhD and 26.4% Diploma in Pharmacy. 223 (80%) of the participants said that they were familiar with the ADR reporting process on HMC, however 60% of the participants stated that they haven’t submit any adverse report over the last 12 months. The main reasons for not reporting were “no enough time”, “no feedback on my previous”, “ADR reporting is a complex process”, and “I don’t have enough knowledge on how to report ADRs”. Pharmacists perceived that seriousness of the reaction (62.3%); unusual reaction (11%) reaction to new product (8.3%); new were important factors on the decision to report ADR. In addition, only 60 (27.3%) of the participants were aware that VigiBase is the World Health Organization (WHO) online database and only 35% knew that the international centre is located in Sweden.

Conclusion: The pharmacists at HMC had positive attitudes towards pharmacovigilance, but very little experience of ADR reporting. Educational Programs are required to train pharmacists and pharmacy technicians towards ADRs and reporting. HMC should also introduce awareness programs and encourage the pharmacists and pharmacy technicians to report more ADRs spontaneously.
Submission Category: Safety / Quality

Session-Board Number: 4-140

Poster Title: The impact of pharmacist medication reconciliation on care transitions to a sub-acute rehabilitation (SAR) facility

Primary Author: Daniel Fitzgerald, Hunterdon Medical Center; Email: dfitzgerald@hhsnj.org

Additional Author(s):
Ashmi Philips
Hinal Patel
Rani Madduri
Navin Philips

Purpose: The period following hospital discharge is a vulnerable time for patients. Adjustments are often made to medication regimens including additions, deletions, and dosage adjustments. Currently, approximately 25 percent of adult patients experience an adverse event following hospital discharge. Half of these events are considered preventable, and another third are considered ameliorable if therapy was optimized. The objective of this study was to evaluate the impact of pharmacist-mediated medication reconciliation on the quality of care transitions to a sub-acute rehabilitation facility.

Methods: Retrospective Arm: Patients were included if they were transferred to sub-acute rehabilitation from December 2016 to February 2017, 65 years of age and older, and taking 8 or more medications. A random sample of 20 patients was evaluated for this study. The Discharge Medication Report and electronic health record was utilized to identify any discrepancies that existed at hospital discharge based on the patient’s comorbid disease states and hospital course. These discrepancies were then classified according to type and subsequently analyzed though the patient’s sub-acute rehabilitation admission to identify if any corrections were made. Interventional Arm: Patients who were actively discharged from the hospital to sub-acute rehabilitation were identified using the Active Discharge Queue and their discharge medication reconciliation was be facilitated by the investigating pharmacist. The pharmacist utilized at least two quality sources of reference to mimic the current Transitions of Care medication reconciliation process. Discrepancy data was collected and classified as for the retrospective arm. The outcome of the pharmacist intervention was collected as well.
Results: In the retrospective arm, 51 percent of the discrepancies were not addressed during sub-acute rehabilitation admissions. Looking at all discrepancies in the study, 66 percent had the potential to cause an adverse event if left unaddressed. Common included medication omissions, drug-drug interactions, inappropriate therapy, and incorrect dosing. In the prospective arm, common discrepancies identified were inaccurate admission medication reconciliations leading to omission or duplication of therapies. A majority of the prospective interventions were accepted by the prescriber (75 percent).

Conclusion: A significant number of medication discrepancies were unaddressed throughout patient transfers from acute to sub-acute facilities. A majority of these errors had the potential to cause an acute adverse event that could lead to readmissions. Prospective interventions were readily accepted and would not be a hindrance to implementation. Expanding current Transitions of Care services to include sub-acute rehabilitation transfers would be an effective way to optimize therapy for these patients.
Submission Category: Safety / Quality

Session-Board Number: 4-141

Poster Title: Evaluating the use of various insulin regimens when D50 is used in the event of severe hypoglycemia.

Primary Author: Melanie Flinn, Baylor Scott and White White Rock; Email: melanie.flinn@tenethealth.com

Additional Author(s):
Jacqueline Pitts
Rony Alias
Thien-An Huu Nguyen

Purpose: To evaluate the various insulin regimens when D50 is used in hypoglycemic events

Methods: A retrospective chart review was performed on patients who received at least one dose of D50 from November 2016 to January 2017. Data collected included demographics, location, type of diabetes mellitus, insulin regimen used prior to D50 dose and number of D50 doses administered.

Results: A total of 52 patients were given D50 between November 2016 and January 2017 with a total of 105 doses administered. The mean age was 58 years old, 21 males and 31 females. Patient characteristics extracted from the analysis found severe hypoglycemia was more likely to occur in older-age (50-80 years old), female, and patients with type II DM. D50 administration occurred most often in the ICU and SD units likely due to patient critical-state, pre-existing comorbidities, duration of stay, and intensity of insulin therapy. Out of the 105 doses of D50 given, 34 patients received sliding scale insulin, 21 had intermittent or long acting insulin, and 50 patients received no insulin. Of note 13 of the 52 patients had both a sliding scale and an intermediate / long acting insulin on their profile. Most patients received one or two doses of D50 12.5gm/25mL or D50 25gm/50mL with increased frequency in the late-evening hours (28 doses given between 20:00 and 23:59).

Conclusion: Based on our evaluation, improvements should be made to our insulin sliding scale and hypoglycemia treatment protocol. Our current insulin sliding scale protocol should be modified to be less aggressive and our “very high dose insulin sliding scale” should be removed. We also concluded that the physician should be notified earlier on in a hyperglycemic patient.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Additionally, our hypoglycemia protocol needed to incorporate the use of glucose gel if the patient was able to take oral medications. Changes to these protocols were presented at the hospital pharmacy and therapeutics committee meeting and will be further utilized to assess protocol performance.
Submission Category: Safety / Quality

Session-Board Number: 4-142

Poster Title: Evaluation of transition-of-care pharmacist contribution for patients admitted through the emergency room

Primary Author: Abiy Getahun, The George Washington University Hospital; Email: abiy.getahun@gwu-hospital.com

Additional Author(s):
Mark Prue
Parth Soni
Robbie Kattappuram
Sarita Tang

Purpose: A patient’s transition of care between healthcare providers and facilities requires proper communication to ensure complete transfer of information between all parties. Based on literature, Best Possible Medication History (BPMH) is an essential component of care transition. The goal of this project was to evaluate the incidence of medication reconciliation discrepancies for patients admitted through the emergency room (ER).

Methods: This was a prospective study evaluating patients admitted to the cardiology and medicine services via the ER at an urban teaching hospital from October 2015 through January 2017. Transition-of-care pharmacists and Advanced Pharmacy Practice Experience (APPE) students performed a medication reconciliation using BPMH within 24 hours of patient admission. Utilizing the BPMH process, patients and/or caregivers were interviewed, followed by at least one additional reliable source of information (e.g. patient’s pharmacy, provider’s office, nursing home, rehab facility). Discrepancies such as omissions, among others, were identified and reviewed monthly by an independent third party.

Results: Data collected over 16 months included 359 patients interviewed with admission medication reconciliation performed by non-pharmacy ER staff. Upon utilization of BPMH tool by pharmacy staff, 215 (60%) out of 359 medication reconciliations contained discrepancies. Of the 215 discrepancies, 65 (30%) discrepancies were resolved by confirming with other reliable sources. Common medication discrepancies involved omitted dose (52; 24%), frequency (45; 21%), route of administration (39; 18%), and drug name (32; 15%).
**Conclusion:** Standard medication reconciliation completed by non-pharmacist staff in the ER had a considerable number of medication discrepancies. This review suggests pharmacy personnel trained in BPMH in conjunction with pharmacotherapeutic knowledge are able to conduct a more comprehensive medication reconciliation resulting in fewer medication discrepancies. Improving the medication reconciliation process requires obtaining the BPMH and warrants a transition-of-care pharmacist in the ER to identify and resolve medication related problems at admission.
Submission Category: Safety / Quality

Session-Board Number: 4-143

Poster Title: Comparison of the use, risk, and cost of insulin pens versus vials through a failure mode and effects analysis (FMEA) in a community hospital setting

Primary Author: Samantha Hopton, Ohio Northern University; Email: s-hopton@onu.edu

Additional Author(s):
Brooke Taylor
Emily Wells
Mary Ellen Hethcox

Purpose: Insulin pens were designed for patient ease of use at home and to decrease dosing errors. Over time, insulin pen use spread to hospitals, as a more efficient way to deliver insulin to patients. Recently, reports of insulin pens being used among multiple patients has raised awareness of the possible risk of blood borne pathogen transmission. This risk, along with the significant waste of pens upon patient discharge, has brought negative attention to the institutional insulin pen use. This project was designed to prospectively assess the risks and economic consequences of using insulin pens versus vials in a community hospital.

Methods: The 200 bed community hospital adopted insulin pens for meal-time insulin use in June of 2008. Based on recent survey results from the nursing staff, concern was raised about nurses unintentionally using the same pen among multiple patients. Additionally, considerable waste of the insulin pens, upon patient discharge, was noted in the pharmacy. It was determined that a full review of the process of insulin administration and use should be conducted, therefore, a failure mode and effects analysis (FMEA) was proposed. Members of the nursing and pharmacy staff, as well as the process improvement team, mapped the current practice of prescribing, transcribing, dispensing, administering, and monitoring of insulin aspart, insulin glargine and insulin detemir pens. This process mapping, along with a fishbone analysis, helped to identify modes of failure in the process to indicate where improvements could be made. Once the procedure was mapped, possible errors were pinpointed and members determined which errors could produce the most patient harm. Based on best practices from literature and input from the staff, failsafe procedures designed to minimize the risk of harm were developed, implemented, and will subsequently be measured for improvement or failure. The new procedures will be reevaluated in thirty, sixty, and ninety days to assess its success, along with regular biannual and annual reassessments.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** After the initial process mapping with the use of pens, the more significant issues were identified and hazard scores were determined based on occurrence, severity and detection of each identified problem: (1) barcode on pens does not identify for a specific patient which could contribute to unintentional sharing of pens (hazard score = 441); (2) unable to generate legally required outpatient labels to send insulin pens home with patients upon discharge with current technology, adding to waste of insulin in pens (hazard score = 392); (3) no formal process in place to remove insulin pens from specific patient bins upon discharge, potentially contributing to wrong pen being used on a patient (hazard score = 378); (4) conflicting policy for use of multi-dose vials of patients in isolation (hazard score = 343); (5) conflicting policies of the correct place to return and use insulin, possibly increasing waste (hazard score = 294); (6) mealtime insulin delivery based upon patient’s communication of meal delivery (hazard score = 245). Additionally, cost savings were calculated to exceed $50,000 annually by switching from pens to vials. Potential changes to the system were discussed and the new process was then mapped to review additional areas for improvement.

**Conclusion:** Due to the risk of pen sharing among multiple patients and economic concerns of waste, the process improvement team decided to switch from insulin pens to vials for all insulin delivered to patients. Basal insulin will be drawn up in patient specific syringes by the pharmacy department and sent to each individual patient’s room for administration. Bolus insulin will be drawn up by the nursing staff for mealtime insulin administration, using a patient specific vial. Patient and employee safety will be closely monitored throughout implementation to determine if further changes need to be made to the new procedure.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-144

Poster Title: Enhancing admission medication histories on a pre-operative nursing unit

Primary Author: Chelsee Jensen, Mayo Clinic; Email: jensen.chelsee@mayo.edu

Additional Author (s):
Laura Myhre
Loghry Lindsey

Purpose: Accurate and complete home medication lists are necessary to ensure patient safety at transition of care including hospital admission and discharge. These lists can be obtained by completing a medication history at time of admission. The aim of this project was to enhance our medication histories on pre-operative area through nursing education and increased pharmacist presence.

Methods: A pharmacist provided nursing education at a nursing staff meeting and created a powerpoint presentation that could be further referenced related to tips on how to accurately and completely document home medication, as well as update the patient’s home pharmacy information if follow-up questions are needed. Additionally, a pharmacist was provided to assist with medication histories on the pre-operative nursing unit on three mornings per week from six to eight o’clock in the morning. All staff pharmacists were oriented to the area prior to project implementation. The primary outcome is to increase medication history verification by a pharmacist within twenty four hours of admission on this pre-operative unit from 0 to 80% on the days that a pharmacist staffed this area. The secondary outcome is to increase medication history completed by a pharmacist within twenty four hours of admission to 50% or greater for all patients admitted through the pre-operative unit on days that a pharmacist is not present by increasing nursing documentation of home pharmacy information and enabling pharmacists to call and verify medication lists if patient interview is not possible.

Results: Over a three month timeframe since project initiation the average twenty four hour medication history verification by pharmacist on days we have staffed the pre-operative nursing unit was 93.1 percent. Over a three month timeframe since pilot roll out the average twenty four hour medication history verification by a pharmacist on days that a pharmacist did not staff the pre-operative nursing unit was 33.4 percent. On an average day, eleven patients
are admitted through this preoperative unit each day and on average 10.6 patients had their medication history completed by a pharmacist during the three month pilot period.

**Conclusion:** Staffing a pharmacist on a pre-operative nursing unit greatly increased the amount of medication histories completed by a pharmacist within twenty four hours of hospital admission. Expanding pharmacist presence to include staffing on five days per week could further improve medication history verification by a pharmacist at point of admission and subsequent patient safety with accurate medication lists and admission medication reconciliation.
Submission Category: Safety / Quality

Session-Board Number: 4-145

Poster Title: Development of a quality system compliant with USP < 797> in a research hospital pharmacy

Primary Author: Amber Johnson, Rockefeller University Hospital; Email: ajohnson01@rockefeller.edu

Additional Author(s):
Robert MacArthur

Purpose: The scope of practice for hospital research pharmacies typically includes preparation of low, medium, and high-risk sterile products. Compared with 503(a) pharmacies and 503(b) outsourcing facilities, batch sizes are often small, and compounding may include use of GMP Active Pharmaceutical Ingredients studied under Investigational New Drug Applications. USP < 797> requires that facilities have a formal, written Quality Assurance and Quality Control program. This project involves the development and implementation of a USP < 797> compliant Pharmacy Quality System (PQS) from a data collection, management, reporting, and distribution perspective suitable for a research hospital pharmacy.

Methods: Project scope and implementation plans were developed. USP < 797> was reviewed, along with recent FDA guidance documents, issued since implementation of the Drug Quality and Security Act (DQSA). A platform was created using software readily accessible in academic research settings, including SAS, MS ACCESS, and MS EXCEL. Included in the platform was a user friendly data collection interface suitable for each of the quality areas identified by USP. Data entered, once verified, can be protected and locked. The platform was created to be both scalable and flexible, to accommodate a wide range of projects, changes to infrastructure and new equipment. Specific reports were generated for each type of user and quality reviewer. Reporting pathways included immediate (when results are received), on demand (when audits occur), and periodic (at least annually). A process to incorporate Corrective Action/Preventative Action (CAPA) interventions was included. For periodic staff training and testing (daily, weekly, monthly, bi-annually), a scheduling system with a calendar and emailed reminders was incorporated. Statistical analysis was applied where possible. For each quality area, simulated datasets were generated to validate the system data input, reporting, and distribution functions. All staff was trained on using the platform, including data

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
entry and report generation. Once the system was validated, actual data accrued from the research pharmacy operation was incorporated.

**Results:** A scalable and flexible PQS for use in a research hospital pharmacy was developed. It brings a great deal of organization and control compared to the previous PQS. It incorporates data analysis and trending over time, in all quality areas identified by USP < 797> in a manner far superior to paper based systems.

**Conclusion:** A PQS system was developed and implemented by a research hospital pharmacy. Its use improved access to data, and reporting. It also improved scheduling of staff training and product testing, all of which contribute to improved quality control practices and overall product quality.
Submission Category: Safety / Quality

Session-Board Number: 4-146

Poster Title: Development of an OR pharmacy visual analytics dashboard to track performance, reduce medication errors in anesthesia kits and trays, and identify opportunities for improvement

Primary Author: Clayton Johnston, University of Kentucky HealthCare; Email: clayton.johnston@uky.edu

Additional Author(s):
Kristina Karrick

Purpose: The OR Pharmacy Satellite was in need of a method to identify and prevent errors from occurring in anesthesia trays and surgery kits. A dashboard was created using visual analytics to identify and prevent errors from occurring in anesthesia trays and surgery kit and to keep the error rate below the national average of 5%. The dashboard is also used to track the amount of work accomplished by the OR pharmacy in a specified amount of time while using this data to compare the number of errors with the amount of work that was completed that day, week, or month.

Methods: The Pharmacy IT Department collected drug charges accumulating from the OR Pharmacy Satellite from February 2016 to April 2017. The charges were set up in a dashboard tool to represent how many charges were recorded by OR Pharmacy staff. Medication charges not associated with a specific patient were not included in the data collection. The dashboard allows the user to visualize what medications and how many of each type of medication are used within a specific period of time. The OR Pharmacy Satellite tracked the medication errors reported from anesthesia providers, surgical nurses, pharmacy technicians, and pharmacists. The date, time, type of error, medication, description, and technician who made the error were recorded in a spreadsheet. All data collected was converted into multiple pivot tables and charts. The dashboard updates in real time once new charges or reported errors are recorded in the spreadsheet.

Results: Previously, the OR Pharmacy Satellite was recording all error data on a hand-written log, which made it difficult to visualize trends in the data. The dashboard has made the process more efficient and useful. The dashboard contains graphs that show the number of errors made by each pharmacy technician, which medications are involved in the most errors, which
department is reporting the most errors, and the error type. The dashboard also contains graphs that illustrate the number of patient visits to the perioperative space, the number of charges, the drugs that are charged for most often and which trays and kits are being used predominately for the specific time period.

**Conclusion:** The OR Pharmacy Satellite dashboard has been an efficient and effective tool to help visualize correlations between workload, errors, and trends in errors.
**Submission Category:** Safety / Quality

**Session-Board Number:** 4-147

**Poster Title:** Assessment of an institutional review board consent forms at the university level

**Primary Author:** Karen Kier, Ohio Northern University; **Email:** k-kier@onu.edu

**Additional Author(s):**
Kaitlin Bova

**Purpose:** All research involving patients requires informed consent to be obtain before a person can participate in a study. The Institutional Review Board (IRB) serves to protect research participants by reviewing study protocols and consent forms. The purpose of the project was to protect research participants as well as minimize legal risks to the university and researchers by improving the informed consent process. The project aimed to assess informed consent forms submitted to the IRB for completeness, analyze the current informed consent resources available from the University IRB, and make recommendations to the IRB chair to improve the informed consent process.

**Methods:** The chair of IRB released all 21 consent forms from the 2016-2017 academic year to be assessed and analyzed for the project. A rubric was created to assess each informed consent form based on the inclusion of the twelve basic elements of informed consent from the Health and Human Services Office for Human Research Protections. This rubric was validated in a similar study performed by the investigational drug division within the pharmacy department at a large non-profit academic medical center. The rubric also included documentation of informed consent (signatures of the participant and research team member) and a readability level less than eighth grade. Readability was assessed with the SMOG (Simple Measure of Gobbledygook) readability formula as suggested by the Center for Medicare and Medicaid Services. The SMOG formula has been identified as the gold standard for determining health literacy. The IRB chair prepared copies of the consent forms and blinded the researchers’ names for the purpose of this project. The study researchers were blinded to the research project and the name of the researchers throughout the entire process. After the consent forms were assessed for the fifteen requirements, the University’s informed consent template was assessed with the same rubric. Descriptive statistics were used to present the data to the University and the chair of the IRB committee.
Results: A total of twenty-one consent forms were assessed for the fifteen requirements on the rubric. Eight consent forms met less than fifty percent of the requirements. Eleven consent forms met approximately seventy-five percent of the requirements. Two consent forms met fourteen of the fifteen requirements, however no consent forms met all fifteen requirements. The University’s current template was available as a PDF on the website after logging in with an account. The template met twelve of the requirements. The template did not clearly state that the study involves research or the purpose of the study and had a readability level of grade fifteen. It appeared as though researchers followed the web-based template for thirteen of the consent forms. For these thirteen, the average number of requirements met was eleven compared to an average of six and three-fourths requirements met when the template did not appear to have been used. Based on these results, the researchers suggested an updated template with clearly labeled sections and additional guidance for researchers. An introduction was added to describe informed consent, provide additional resources, explain how to calculate readability, and provide the rubric from this project for researchers to self-assess their informed consent forms.

Conclusion: The project plan, results, and recommendations were shared with the IRB. The results suggest that changes are needed to improve the informed consent process in order to protect the rights of research participants. When the web-based template was used, consent forms met more of the requirements. Recommendations were made to improve the informed consent process including increasing accessibility to an updated template on the IRB webpage, guiding researchers to use the template, and finally assessing consent forms submitted to the IRB with the rubric from this project to enhance safety and quality in the research process.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-148

Poster Title: Using quality improvement methodology to implement a pharmacist-led medicines reconciliation service

Primary Author: Mariosa Kieran, Mater Misericordiae University Hospital; Email: mkieran@mater.ie

Additional Author (s):
Jennifer Brown
Patrick Murray
Gordon Dunne
Ciaran Meegan

Purpose: Quality improvement projects implement evidence based standards to improve clinical care or processes outcomes that are measurable and sustainable.
Provision of medicines reconciliation (MR) is an international healthcare priority. MR is one of the World Health Organisation’s (WHO) High 5s patient safety priorities. This is reflected in Ireland through MR inclusion in Department of Health and regulatory body guidelines. Pharmacists are the preferred profession for undertaking MR, however, this is a resource intensive activity.
The purpose of this study is to utilise quality improvement methodologies to implement and measure a pharmacist-led MR service.

Methods: - Drugs and Therapeutics Committee assessment of the strategic MR requirements. - Development of a business case and service scoping document for hospital Chief Executive Officer (CEO) review and authorisation. - Appointment of a dedicated MR pharmacist.- Stakeholder engagement pre-implementation to ensure support for the service.- Identification of Key Performance Indicators (KPIs) for measurement, comparison and review to ensure on-going evaluation of the MR service within specified targets.

Results: CEO approval was obtained for phased implementation of a pharmacist-led MR service. The MMUH MR service commenced in July 2016 with one dedicated MR pharmacist. The MMUH MR service is modeled on WHO Guidance which specify; - The priority patient cohort; Patients aged - 65 years admitted through the Emergency Department. - Service measures, sampling criteria and targets to quantify MR service capacity and quality.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Use of internationally recognised measurements that can be readily captured has enabled ease of feedback and interpretation on service capacity and quality. While a resource input is required, such measurements are critical for recognition of good practice, identification of areas for practice modification and securing ongoing support. Alignment of the MMUH service with international standards was recognised in the Irish regulatory body’s medication safety inspection as an example of good practice.

**Conclusion:** MR services are recognised to improve medication and patient safety and is a priority practice in the MMUH strategy and reforms. A quality improvement MR project was proposed. Phase one of a resourced pharmacist-led MR service was implemented in 2016. Service quality and expansion requirements are assessed using internationally recognised measures. The measurements enable on-going review of service performance.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-149

Poster Title: Evaluating the accuracy of a medication reconciliation process during transition to a long-term acute care hospital (LTACH) to minimize preventable medication errors

Primary Author: Helena Lee, Comprehensive Pharmacy Services; Email: hlee@bridgepointhealthcare.com

Additional Author(s):
Vernetta Scott
Quitina Lewis
Iman Ahmed
Judith Correia

Purpose: Poor care coordination of our most vulnerable populations from the hospital to the long-term acute care hospital (LTACH) setting is often linked to inaccurate medication reconciliations. Based on one study comparing the accuracy of medication information in discharge summaries and patient care referral forms, mismatched information and at least one discrepancy were reported in 52.3% and 71.4% of admissions to skilled nursing facilities, respectively. However, there is little known about the prevalence of medication discrepancies that may occur during transitions to LTACHs. This study was designed to evaluate medication discrepancies during the admission process at an LTACH to identify opportunities to minimize preventable errors.

Methods: A retrospective medication reconciliation audit was performed in an 82 bed LTACH. One hundred forty four patient charts for individuals admitted to the facility within the period of 11/1/2016 to 3/9/2017 were reviewed. The audit included three areas of focus: medication information in the discharge/transfer summary, medication reconciliation form documents, and physician’s admission orders. This review process creates the most accurate list possible for all medications a patient is prescribed which proves effective in preventing adverse drug effects and providing correct medications at all transition points. Home medication lists were not reviewed in this study because all of the patients admitted during the study period were transitioned from acute care hospitals. Full compliance with the established medication reconciliation process required that all three documents be filed in the chart, all medication information in all three documents match, and complete medication orders were written on
corresponding forms. If elements were different between sources, even with complete information, it was regarded as a discrepancy.

**Results:** Of the total 144 charts reviewed, medication discrepancies were identified in 119 (83%) patient charts during the transition process. The transfer/discharge summary was missing from 23 patients (16%), and incomplete medication information including omitting the dose, frequency, route, or indication for PRN or “as needed” orders in the transfer/discharge summary accounted for 26 patients (18%). Incomplete medication reconciliation forms or disagreement between these forms and the discharge/transfer summary were found in 76 patients (53%). Medication orders did not correspond to those medications listed on the reconciliation forms for 29 patients (20%).

**Conclusion:** The study showed a higher prevalence of medication discrepancies during the transition process to an LTACH facility compared to published data on long-term care facilities. Most LTACH patients are medically complex and need to be treated with fifteen or more medications, which increases the potential risk of medication errors. To address this, strong efforts to improve the accuracy of the medication reconciliation process during transitions of care must be made both within a hospital and between healthcare facilities. This study supports the need for further evaluation of strategies for improving the medication reconciliation process during transitions of care to reduce medication errors.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-150

Poster Title: Developing and implementing a systematic approach to hazardous drug management

Primary Author: Jayne Lepage, MCPHS University; Email: jayne.lepage@mcphs.edu

Additional Author(s):
Elizabeth Isaac

Purpose: To describe the development and implementation of a systematic approach to hazardous drug management in a large academic medical center to prevent occupational exposures to antineoplastic and other hazardous drugs. To ensure that all drugs identified by the National Institute for Occupational Safety and Health (NIOSH) are properly handled in all steps in the medication use process.

Methods: A multi-disciplinary team of pharmacy administrators, medication safety experts, pharmacy operations experts, pharmacy faculty and students and nursing was formed. The group was charged with ensuring proper hazardous drug (as defined in the NIOSH List of Antineoplastic and Other Hazardous Drugs in Healthcare Settings, 2016 publication) management in all steps in the medication use process. Group 1: antineoplastic drugs, including those with manufacturer’s safe-handling guidance (MSHG), Group 2: Non-antineoplastic drugs that meet one or more of the NIOSH criteria for a hazardous drug, including those with MSHG and Group 3: Non-antineoplastic drugs that primarily have adverse reproductive effects were reviewed to identify those drugs on formulary or stocked at the institution, including out-patient clinics. The group began with the administration step in the medication use process and worked backwards to drug manipulation and storage in patient care areas, pharmacy delivery, storage and receipt. Every formulary or stocked medication on the NIOSH list in each of the 3 Groups was evaluated and all potential opportunities for occupational exposures were identified. Appropriate procedures for proper handling of those medications identified as having potential occupational exposures were developed and implemented both in the pharmacy and in patient care areas.

Results: Proper management procedures for all formulary and stocked drugs in Group 1 were in existence and being adhered to. Drugs in Groups 2 and 3 lacking proper management procedures to prevent occupation exposures were identified and procedures for safe handling...
were developed and disseminated to pharmacy and nursing. Continuous procedure review and development as well as monitoring of adherence to procedures and standard work to be utilized in the medication use process when using hazardous drugs is ongoing.

**Conclusion:** A systematic approach to hazardous drug management is challenging and complex. Changes to existing workflow requires buy-in at all levels and can be met with staff resistance and may be initially costly to the institution. The significance of occupational safety should be a routine and repeat conversation with staff at all levels.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Purpose: Treatment of asymptomatic bacteriuria (ASB), or bacteriuria without urinary tract infection (UTI) symptoms, is not recommended in most clinical settings. However, overtreatment continues to account for a significant portion of unnecessary antibiotic use. The Centers for Disease Control and Prevention (CDC) recommends that antimicrobial stewardship programs (ASPs) perform routine antibiotic timeouts and provides a tool for clinicians to evaluate patients on antibiotics for suspected UTIs. We sought to assess the feasibility of the use of such a tool by ASPs to evaluate patients with positive urine cultures in multiple acute care hospitals of varied size, scope, and ASP maturity.

Methods: The CDC’s UTI Assessment form was adapted to collect: demographic, clinical, and laboratory data; presence of specific UTI symptoms (e.g. urgency, frequency, dysuria), non-specific UTI symptoms (e.g. fever, leukocytosis) and altered mental status (with assessment of underlying causes); microbiological results; and antimicrobial therapy and duration. Each facility retrospectively applied the assessment tool to a sampling of 15-20 acute care patients with a positive urine culture from February 1 - 28, 2017 and recorded the time required to complete the assessment. Patients were excluded if: pregnant, undergoing urologic procedure, aged less than 18 years, neutropenic, or were admitted on UTI therapy or with nephrolithiasis.

Results: Data from 246 included patients representing 16 hospitals are reported. Most facilities (72%) who completed the assessment form have established ASPs staffed by designated pharmacists with additional training in stewardship or Infectious Diseases (ASP pharmacists). The remaining facilities (28%) incorporate stewardship into daily pharmacy workflow, primarily
utilizing clinical staff pharmacists (CSPs) who are also responsible for clinical, distributive, and administrative duties. Among completed assessment forms, 50% were completed by ASP pharmacists. The remaining were completed by CSPs (26%), an infectious disease (ID) physician (14%), clinical pharmacy managers (CPMs) (7%), and an infection prevention (IP) nurse (3%). The mean time required to complete the form overall was 15.3 minutes (standard deviation (SD) 9.4). The mean time for completion was shorter at facilities with well-established ASPs versus those without (12.9 (SD 5.3) versus 21.4 (SD 13.8) minutes). The mean time (SD) for completion in minutes by job title was reported as follows: ASP pharmacists 13.0 (5.9); CSPs 20.5 (14.9), CPMs 12.2 (3.1); ID physician 14.1 (2.8); and IP nurse 20.6 (5.0).

**Conclusion:** Completion of an assessment tool in patients with a positive urine culture required significant time, especially at institutions with limited resources. ASP pharmacists and CPMs required less time likely because these pharmacists routinely review patients and have residency training or equivalent experience. That tool utilization required more time for CSPs may be due to a combination of less stewardship training and balancing multiple responsibilities with limited uninterrupted time for assessment. Streamlining will be required for tool integration into workflow. At institutions relying on CSPs to perform stewardship, additional training and allocation of dedicated time will be required for successful implementation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-152

Poster Title: Evaluation of a pharmacist-optimized education and transition (POET) service at a community teaching hospital

Primary Author: Kristen Longstreth, St. Elizabeth Youngstown Hospital; Email: kristen_longstreth@mercy.com

Additional Author(s):
Jacqueline Frank
Janelle Rhodes
Danielle Gill
Barry Shick

Purpose: The purpose of this pilot study was to provide a pharmacist-led education and transition of care service to patients located on an intermediate telemetry unit and evaluate the effects of this service on the following: hospital readmissions at 30 days post-discharge, emergency department (ED) visits without admission at 30 days post-discharge, patient satisfaction scores, and pharmacist identification and correction of medication reconciliation discrepancies and drug therapy problems.

Methods: The institutional review board approved this prospective pilot study of a pharmacist-led education and transition of care service for patients with a planned discharge to home from an intermediate telemetry unit. Pharmacists provided a service five days per week that focused on the following activities: reviewing the admission and discharge medication reconciliation process to identify and correct unintentional discrepancies, correcting both the home and discharge medication lists, identifying and resolving drug therapy problems, and educating the patient on medication changes that were made during hospitalization (discontinued or modified medications) and new discharge medications. Pharmacists documented progress notes and recorded their interventions in the electronic medical record. Pharmacist activities were discontinued if the patient transferred to another nursing unit prior to discharge, however these patients were evaluated for program outcomes. Data collection included: patient demographics (including a readmission risk score); pharmacist services provided to each patient; number of medication reconciliation discrepancies and category (inaccurate or incomplete information); number of drug therapy problems and pharmacist recommendation category (drug discontinuation or initiation, therapy or dose change, adverse event prevented, ...
or miscellaneous); provider acceptance rate of pharmacist recommendations; hospital readmission rate at 30 days post-discharge; ED visitation rate without admission at 30 days post-discharge; and the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey data for the pilot nursing unit.

**Results:** During the six-month pilot period, pharmacists interacted with 424 patients and identified 303 unintentional discrepancies on medication reconciliation (195 discrepancies due to inaccurate information and 108 discrepancies due to incomplete information). Discrepancies were due to physician reconciliation error (50.4 percent), history error due to incomplete or inaccurate home medication information (18.3 percent) or a combination of reconciliation and history errors (31.3 percent). Pharmacists solved 350 drug therapy problems (including correction of reconciliation discrepancies), with the following recommendations: 118 drug discontinuations, 68 drug initiations, 25 therapy changes, 74 dose changes, and 65 miscellaneous interventions. Pharmacists classified 111 drug therapy problems as significant enough that an adverse outcome or readmission was probable if appropriate action was not taken. Provider recommendation acceptance rate was 91 percent. The 30-day readmission rate for pilot program patients was 19.6 percent, compared to a 24.1 percent baseline for the nursing unit in 2016. Readmitted patients had a higher average readmission risk score. The 30-day ED visitation rate (without admission) was decreased from 40.7 percent (in 2016) to 11.6 percent. HCAHPS survey scores improved during the pilot period for the following categories: communication with nurses, help from hospital staff, communication about medications, discharge instructions and care transitions.

**Conclusion:** Implementation of a pharmacist-led education and transition of care service resulted in a decrease in both the 30-day readmission rate and ED visitation rate for a telemetry nursing unit. While providing these services, pharmacists identified and corrected numerous medication reconciliation discrepancies and solved additional drug therapy problems. In addition, HCAHPS survey scores related to communication, education, and care transitions improved for the nursing unit. The results of this six-month pilot program support expansion to additional hospital nursing units.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-153

Poster Title: Insulin distribution and administration process improvement at an academic medical center

Primary Author: Brendan Meyer, UAB Hospital; Email: bmeyer@uabmc.edu

Additional Author (s):
Christopher Chapleau
Matthew Joiner
Lakeyra Palmer
Rajesh Speer

Purpose: Design steps for improvement of the current insulin distribution and administration processes at UAB Hospital.

Methods: A failure mode and effects analysis (FMEA) was conducted to determine areas for improvement in the current processes for the distribution and administration of insulin. Causes of failures were evaluated to design innovative process improvements. A small group of nurses and pharmacists was created to perform a gap analysis between current practices and best practices recommend in a recent article in the American Journal of Health-System Pharmacy.

Results: Creative solutions were generated using the results of the FMEA and gap analysis. High-alert storage interdisciplinary policies were updated to ensure proper storage of insulin products. A safety alert was implemented that fires as insulin pens are removed from automated dispensing cabinets (ADC). Insulin education was developed and added to annual training requirements.

Conclusion: The study examined the institutions practices for insulin distribution and administration. We determined that optimal features to support best practice were not achieved and our practices needed to be evaluated. While all measures to support best practice could not be implemented at this time, we were able to leverage our current ADC software and training to implement much needed process improvements.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Safety / Quality

Session-Board Number: 4-154

Poster Title: Implementation and evaluation of a proton pump inhibitor de-escalation program

Primary Author: Andrea Nguyen, San Francisco Veterans Affairs Medical Center; Email: andrea.l.nguyen@gmail.com

Additional Author(s):
Beth Keeney
Audrey Lee

Purpose: Proton pump inhibitors (PPIs) are among the most widely used medications in the U.S., but many patients take them chronically without an appropriate indication. Treatment with PPIs is not without risks as evidence demonstrates potential risks with chronic use, such as fractures, Clostridium difficile infection, pneumonia, and hypomagnesemia. The Veterans Affairs Health Care System (VAHCS) utilizes a clinical dashboard to enhance safety monitoring for Veterans prescribed high-risk medications, including low gastrointestinal (GI) bleed risk patients on extended PPI trials. This project was designed to implement and evaluate a clinical pharmacist-driven PPI de-escalation program at a VAHCS primary care clinic.

Methods: This quality improvement project was approved by the Veterans Health Administration Office of Research and Development. The clinical dashboard low GI bleed risk extended PPI trial measure was used to identify patients in whom to potentially de-escalate therapy. Patients with primary care clinic appointments from October 2016 to January 2017 were targeted for chart review. The primary endpoint was the percentage of patients identified on the dashboard initiated on de-escalation therapy. Secondary endpoints consisted of determination of the program’s direct total annualized drug cost savings and comparison of the clinical dashboard performance measure scores before and after program implementation. Implementation of the de-escalation program included pharmacist evaluation of the appropriateness of PPI indication. After identification of patients who were candidates for PPI de-escalation therapy, the pharmacist then developed and documented recommendations based upon a treatment algorithm recommended by the Veterans Integrated Service Network in the electronic patient medical record. Evaluation of the program included a chart review one month after the patient’s clinic appointment to determine if recommendations for de-
escalation were accepted and implemented. A cost analysis was performed based upon direct prescription cost-savings.

**Results:** 120 patient charts were reviewed; 8 patients were excluded since they were no longer receiving primary care at the VAHCS. Of the 112 patients included, 57 patients (51%) were found to have inappropriate indications for chronic PPI therapy and de-escalation recommendations were made. Of those 57 recommendations, 30 were accepted (53%). Recommendations accepted included either a decrease in PPI dose (n=15, 50%), step-down to a histamine-2 receptor antagonist and/or antacid therapy (n=11, 37%), or PPI discontinuation (n=4, 13%). Reasons for no changes in PPI therapy (n=27, 47%) included lack of chart documentation by the primary care provider (PCP) (n=13, 48%), appointment cancellations (n=6, 22%), and PCP or patient decline of de-escalation therapy (n=8, 30%). The VAHCS performance measure score was 52.5% at the beginning of the project in October 2016 and 52.2% at the end of the project in January 2017. Direct cost savings to the VAHCS was $375 per year.

**Conclusion:** Pharmacist involvement led to an increased number of patients initiated on de-escalation therapy and minor direct drug cost savings to the institution.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-155

Poster Title: Medication dosing in dialysis dependent end stage kidney disease patients: a single center retrospective review

Primary Author: Daryl Nnani, The Mount Sinai Hospital; Email: daryl.nnani@mountsinai.org

Additional Author(s):
Timothy Nguyen
Archna Jariwala
Vijay Lapia

Purpose: Patients with hemodialysis (HD) dependent end stage kidney disease (ESKD) are more prone adverse events and poor outcomes due to inappropriate medication dosing. The purpose of this study was to assess the appropriateness of medication dosing in hospitalized HD dependent ESKD patients.

Methods: This was an IRB-approved, single-center, retrospective medication chart review of adult HD-dependent patients diagnosed with ESKD admitted between 1/2016 - 8/2016. Patients were excluded if they were on peritoneal dialysis, admitted for kidney transplantation, or had missing pertinent information. The appropriateness of medication dosing was assessed by evaluating inpatient medication orders compared to drug manufacturer and tertiary reference renal dose adjustment recommendations on day one of admission.

Results: A total of 509 patients were eligible to be included in the review. Overall, 165/509 (32.4%) of patients were determined to have inappropriate medication orders. A total of 221 medications orders were not appropriately renally dose adjusted in this study. The most frequently inappropriately ordered medications were anticonvulsants 58/211 (26.1%), opioids 57/221 (25.6%), antibiotics 36/221 (16.2%), histamine-2 receptor antagonists 18/221 (8.1%) and HMG-CoA reductase inhibitors 14/221 (6.3%). Morphine sulfate accounted for 82.5% of inappropriate opioid medication orders and gabapentin accounted for 65.5% of inappropriate anticonvulsant medication orders.

Conclusion: A high percentage of kidney disease patients experienced medications dose inappropriately due to decrease kidney function. In this study opioids and anticonvulsants,
specifically gabapentin and morphine accounted for a majority of inappropriately dosed medications.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-156

Poster Title: Impact of standardized infliximab dose rounding in an outpatient infusion center

Primary Author: Jiyeon Park, Englewood Hospital and Medical Center; Email: jiyeonpark1214@gmail.com

Additional Author(s):
Lauren Boutillier
GaEun Joung
Joseph Cruz
Jeffrey Nemeth

Purpose: Infliximab dose rounding is a commonly accepted practice across many institutions for cost containment. The objective of this study is to determine whether standardized infliximab dose rounding is clinically comparable to non-rounded dosing in patients on infliximab for Crohn’s disease or ulcerative colitis. Additional objective of the study is to compare the cost between the two dosing methods in the outpatient infusion center.

Methods: A retrospective electronic chart review was conducted to identify patients who received infliximab for ulcerative colitis or Crohn’s disease over a six-month period. The primary endpoint was increase in dose or frequency as a surrogate marker for inadequate response to therapy, and the co-primary outcome was cost comparison between standardized versus non-rounded infliximab doses. The secondary outcomes were estimated time taken for order entry, number of order clarifications needed, and number of patients who switched to alternative therapy. Safety analysis included use of medications for hypersensitivity or any other adverse effects. Descriptive statistics and Fisher’s exact test were used for summary and analysis of data. This study was approved by the institutional review board.

Results: A total of 94 patients were evaluated, and 72 patients met the inclusion criteria (45 in the standardized arm and 69 in non-standardized group with some patients overlapping in both groups). 1 out of 45 patients in the standardized group, and 1 out of 69 patients in the non-standardized group had increase in infliximab dose or frequency (2.22% vs. 1.45%, P=1.000). In contrast to non-standardized dosing, standardized dosing could save an estimated cost of $104,640 to $165,600 per year depending on the number of patients receiving infliximab each month. The mean time to order entry were 10 minutes vs. 12 minutes in non-standardized and
standardized groups respectively; however, if the first time use of standardized form was excluded, the mean time in standardized group was reduced to 8 minutes. Two patients in non-standardized group and none in standardized group switched to alternative therapy (2.90% vs. 0%, P=1.000). There was no difference in usage of medications for adverse drug effects (0% vs. 0%, P=1.000).

**Conclusion:** The safety, efficacy, and efficiency were similar in standardized vs. non-standardized dose rounding of infliximab, but standardization was significantly more cost effective.
Submission Category: Safety / Quality

Session-Board Number: 4-157

Poster Title: Development of cold chain distribution procedures for specialty medications in a health-system based specialty pharmacy

Primary Author: Veranika Sasnovskaya, University of Illinois at Chicago; Email: vsasno2@uic.edu

Additional Author (s):
Christopher Oh
Nehrin Khamo
JoAnn Stubbings

Purpose: Specialty medications are high cost drugs that treat chronic, rare or complex disease states and require comprehensive patient management and monitoring. Many specialty medications are temperature-sensitive and must be maintained at a temperature of 2 to 8 degrees Celsius (36 to 46 degrees Fahrenheit), according to manufacturer guidelines, during storage and all excursions such as shipping to a patient’s home. The purpose of this project was to develop packaging procedures for refrigerated medications that maintain product temperature during excursion and under year-round climate conditions.

Methods: University of Illinois Hospital and Health Sciences System Specialty Pharmacy Services (UI-SPS) is an accredited specialty pharmacy. Specialty medications are delivered by courier to patients within a 200-mile radius of the hospital. Staff at UI-SPS tested procedures for cold chain distribution over a period of 12 months. Over 60 tests were performed using different configurations of standard packaging materials. Each tested package included a dummy medication box with a temperature monitor affixed in it, bubble wrap, multiple single-use cold packs, an insulated container, and an outer cardboard box with another temperature monitor affixed to it. Each test package was left outside for at least 24 hours to simulate outdoor excursion conditions. After retrieval, data from the temperature monitors were downloaded onto a computer using software that provided a continuous graphical display of product temperature and corresponding outdoor temperature during the testing period. A packaging configuration was considered successful if it consistently maintained manufacturer recommended product temperature for at least 24 hours during excursion.
Results: Cold chain distribution procedures were validated for temperatures between 18 and 95 degrees Fahrenheit. Three configurations of packaging materials were identified that maintained product temperature within manufacturer guidelines for 24 hours including a configuration for winter, another for spring/fall, and a third for summer. The configurations differed in the amount of bubble wrap used, the number and placement of cold packs, and the use of frozen or refrigerated cold packs. Diagrams of the configurations will be provided. Further testing of extreme temperature conditions will be conducted. Validation of each method will be performed biannually or if any packing material is changed.

Conclusion: UI-SPS established a standardized validated procedure for cold chain distribution that is in accordance with manufacturer's temperature requirements and specialty pharmacy accreditation requirements. Results of this study may be useful to other health system-based specialty pharmacies.
Submission Category: Safety / Quality

Session-Board Number: 4-158

Poster Title: Improving on-time medication administration by identifying and overcoming barriers

Primary Author: Praharsh Shah, Riverside Community Hospital; Email: praharsh.shah@hcahealthcare.com

Purpose: Timely medication administration is directly related to effective patient outcome. Healthcare facilities are required to have policies and procedures implemented to allow timely administration of the medications. CMS standard 482.23 (c) requires medications prescribed more frequently than daily but no more frequently than every 4 hours may be administered within 1 hour before or after the scheduled dosing time, for a total window that does not exceed 2 hours. The purpose of the project is to identify and improve the barriers related to late medication administration, leading to improve overall on-time medication administration.

Methods: Pharmacy and nursing worked together with a specific focus on improving timely administration of medications. Baseline on-time medication administration rate was 81% of total scheduled doses administered. The goal of the focused group was 90% on-time medication administration of all scheduled doses. Daily report of late medication administrations was created and reviewed to identify trends. The review of the daily late medication administration report included users with late medication administration, name of medications administered late, total number of late medication administration for each unit, and reasons for late medication administration. Individual meetings from nursing leadership were held with these users to identify the barriers. Pharmacy implemented review of daily medication requests to possibly identify the barriers for missing medications resulting in late medication administration. Routine rounding on nursing units by pharmacy and quality gathered to identify their issues resulting late administration of medications. Various barriers leading to late medication administration were identified and resolved by implementing workflow improvements. The detail information of barriers identified and resolution of the identified barriers were communicated in daily huddle to the nursing and pharmacy staff. Monthly on-time medication administration was tracked to measure the improvement.

Results: Current medication verification practice did not allow sufficient time for nurses to administer first dose of any new medications. Pharmacists changed the time of routine first doses to be 90 minutes from ordered time. It allowed nurses to administer doses before and
after 60 minutes of scheduled time. Electronic alerts related to time critical medications and medications stored in refrigerator were added in the label comment sections of medications to help nurses. A direct IV compatibility link was added in eMAR to allow nurses checking IV compatibilities. Standard respiratory medication administration times were adjusted to coincide respiratory staff clinical workflow. Food and dietary services made workflow changes to deliver all diabetic trays before standard short acting insulin administrations time. Pharmacy optimized automated dispensing machines to increase medication PAR to prevent stock outs, added new medications based on the usage, and transitioned to cart-less medication distribution system. Immediate use and point-of care drug addition to IV bag system was implemented which enabled nursing staff to administer continuous titrable medications in timely manner. These efforts helped reducing missing medication requests as well as nursing phone calls to pharmacy. These efforts resulted in achieving the goal of > 90% of on-time medication administration.

**Conclusion:** Identifying and overcoming barriers related to late medication administrations provide an opportunity to improve patient care. The intense focus from departments including pharmacy, nursing, quality, and others play a vital role for success of this project. Consistent communication related to barriers and implemented workflow changes between the hospital leadership and nursing resulted in improved timely administration of scheduled medications as well as increased engagement with leadership team among staff.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-159

Poster Title: Improving time to first dose of broad spectrum antibiotics in patients with severe sepsis utilizing a pharmacy antibiotic alert

Primary Author: Lucy Stephens, Guthrie Robert Packer Hospital; Email: stephens_lucy@guthrie.org

Additional Author (s):
Karen Williams

Purpose: Patients with severe sepsis who receive their first dose of antibiotics within 3 hours of having defined severe sepsis/septic shock have been shown to have a reduction in mortality. Each hour delay in antibiotic administration has been associated with a 7-8% increase in patient mortality. Upon review of abstracted cases, the severe sepsis workgroup identified patients were not always receiving antibiotics within 3 hours. The average time from order to administration was 110 minutes. In our electronic order process, we were not sure if the delays in administration were in pharmacy dispensing or in nursing administration. It is possible the nurse who acknowledges an order for antibiotics may not be the same nurse who administers the antibiotic. Loss of information in handoff between nursing shifts may also play a role. It was identified that neither nurse may know when or where the antibiotic was dispensed. A Pharmacy Antibiotic Alert was designed and studied. The alert served to provide a second notification to the nursing staff, emphasizing the importance of timeliness, while also letting them know the dispense had happened. We theorized the efficiency gained from this process would speed administration of ordered broad spectrum antibiotics

Methods: A multidisciplinary group convened to design a Pharmacy Antibiotic Alert. Patients with orders for broad spectrum antibiotics were included. Broad spectrum was defined as any antibiotic on the list of monotherapy antibiotics for the Centers for Medicare and Medicaid Services Sepsis Core Measure. The initial units chosen were the Intensive care unit and Emergency department. Because there was no electronic dispense time, the Pharmacy Antibiotic Alert was designed as a Vocera notification to nursing team members. This notification has an electronic time stamp that we used as a surrogate for dispense time. Order to administration time was evaluated for instances when pharmacy called with Vocera vs instances when pharmacy did not call and were compared to historical controls. In patients where a Vocera call was made, the average time from order to dispense, and average time from

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
dispense to administration were calculated. Nursing and Pharmacy staffs were asked for feedback on the utility of the process with minor adjustments made to maximize efficiency.

**Results:** Through 3 phases of investigation in the ICU and Emergency Department, average order to administration time was decreased to 34 minutes when the Pharmacy Antibiotic Alert was used. During the pilot, order to dispense time averaged 64 minutes when pharmacy did not call. Based on this data, the Pharmacy Antibiotic Alert will become a permanent notification for all areas of the hospital, and rollout to other system hospitals is expected.

**Conclusion:** In a centralized dispensing model, alerting nursing staff of broad spectrum antibiotic dispense is a useful way to support nursing efficiency and improve speed of administration.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Safety / Quality

Session-Board Number: 4-160

Poster Title: Implementation of an environmental monitoring procedure and utilization of an automated robot for sterile compounding in an institutional clean room setting to increase patient safety

Primary Author: Angela Turner, University of Kentucky Chandler Medical Center; Email: amchul2@uky.edu

Additional Author(s):
Bradley Litteral

Purpose: The prevention of medication errors and contamination is of top priority in sterile compounding practices in a clean room setting. Implementation of a robust environmental monitoring procedure (EMP) identifies potential risks within the clean room that could result in harmful contamination to sterile products. Additionally, the utilization of an automated robot increases the safety, accuracy and sterility of the compounded sterile products (CSP). USP < 797> standards require semiannual nonviable airborne monitoring and monthly viable air borne monitoring. Daily monitoring of the sterile compounding environment, more frequently than USP < 797> standards, decreases risk of contamination.

Methods: An EMP was drafted and implemented with the guidance of a USP < 797> compliance coordinator who specializes in USP < 797> operations. The EMP consists of specific locations in the sterile compounding clean room that test particle counts and viable growth daily, using certified equipment including incubators, particle air sampler and viable air sampler. The technicians perform viable testing inside the automated robot daily. After incubating samples for 14 days, colony-forming units (CFUs) are counted, documented and graphed. Samples above action level receive immediate attention, including evaluation of personnel work practices, cleaning procedures, operational procedures, facilities and equipment functionality, and air filtration efficiency. The clean room is retested once the action level is sufficiently addressed. The automated robot utilizes bar-code scanning, gravimetric, and image capturing to guarantee the correct dose is accurate and precise every time. Following USP < 71> guidelines, a percentage of the extended dated CSP are sterility tested using membrane filtration. The extended date CSP batch is quarantined for 14 days, then released upon sterility tests proving zero growth. All batched CSP are labeled with colored tape that are approved by the American Society for Testing and Materials. Tamper evident caps are affixed to
CSP when applicable, to reduce the possibility of reuse. Providers were given surveys to obtain objective feedback that was analyzed, to validate the EMP and the CSP process.

Results: Successful implementation of an EMP began in January 2015. Daily documentation of all environmental growth, particulate counts and sterility tests have shown very few action levels have occurred in the clean room. Daily environmental monitoring has provided the ability to pin point and correct high action levels requiring immediate attention prior to the bi-annual testing required by USP <797>. Graphical trends analyzed through time, effectively address action levels before they arise. Patients are receiving a pharmaceutically elegant, safe, and professional product that exceeds standards of USP <797>. Providing CSP at the institution’s standardized dose practices, have reduced possible admixing errors in the operating room setting by eliminating a bulk product to be drawn up by the providers. Through survey responses, the CSP used by the providers were highly favorable and preferred over previous methods. Adding tamper evident caps to the CSP, decreases the recapping of used CSP and introducing them back into inventory. An added benefit is the decrease in waste, which has proven to be cost effective. Furthermore, automation frees up technician and pharmacist time without compromising safety, and patient care.

Conclusion: Implementing an EMP and utilizing an automated robot in an institutional clean room setting has decreased human contamination risks and potential admixing errors. Exceeding USP <797> standards provides the patients with a safe, quality CSP.
Submission Category: Safety / Quality

Session-Board Number: 4-161

Poster Title: Improving patient safety through standardization of oral chemotherapy compounding for pediatric hematology/oncology patients

Primary Author: Shirley Qiong Yan, Memorial Sloan Kettering Cancer Center (MSK); Email: yanq@mskcc.org

Additional Author (s):
Abbie Seeger
Melissa Lee-Teh
Brian del Corral
Sherry Mathew

Purpose: Standardization of oral chemotherapy compounding for hematology/oncology patients is limited, especially in pediatric patients where feeding tube administrations may also exist. A majority of chemotherapy was developed for adult cancer patients; therefore, there is a lack of commercially available oral chemotherapy products in liquid form with stability data for both oral and feeding tube administration creating a unique challenge in pediatric patients who may not be able to swallow tablets or capsules due to their disease or age.

Methods: We identified the need to establish procedures for compounding oral chemotherapy, and formalize recipes with standardized concentrations and stability data for both oral and feeding tube administrations in order to improve patient safety and maintain drug accessibility in pediatrics. A multi-disciplinary task force was formed to address the patient safety challenges due to the lack of standardized concentrations of oral chemotherapy compounds or procedures for preparing these compounds. The task force identified the top ten oral chemotherapy compounds used at the institution, and selected one standardized concentration for each drug to be used for both oral and feeding tube administration. The group continues to meet on a monthly basis to improve workflows and create practices for safe ordering of chemotherapy compounds to increase medication safety for our patients. The group also promotes safe compounding practices for pharmacy staff.

Results: Clinical pharmacists researched and developed recipes to be used. A research pharmacist tested the stability of these recipes if data was not readily available in published literature. All recipes selected have been validated for both oral and feeding tube use, and

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
assigned an appropriate beyond use date. They will be made available on the internal guidelines page to facilitate access to all pharmacists throughout the institution. Chemotherapy operations designated one biological safety cabinet (BSC) with external ventilation for all nonsterile, hazardous compounding. All pharmacy staff involved in oral chemotherapy compounding was fit tested by hospital safety to ensure appropriate sized respirators are being worn during preparation. Personal protective equipment requirements and safe handling practices were outlined in the hospital’s hazardous drug policy. Pharmacy informatics built new drug items and ordersets for these new items. In collaboration with nursing and nutrition, one standardized list of allowable feeding tube routes for the administration of medication was determined. These routes were added to the ordersets built by informatics to ensure the correct recipe (oral versus feeding tube) is used during preparation of compounded medications and correct route of administration is used by nursing. Pharmacy administration formalized a policy summarizing all of these changes.

**Conclusion:** Standardization of chemotherapy concentrations for compounded oral and feeding tube administration for pediatric hematology/oncology patients has improved patient safety and clinician’s satisfaction. In addition, it will eliminate confusion and reduce medication errors during ordering, preparation and administration by standardizing workflow. In the future, this implementation will meet and achieve USP 800 standards and regulations, and can also be adapted and expanded to adult oncology services at our institution.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-001

Poster Title: Follow-up report on the achievement of hemoglobin A1C (A1C) in low-income, uninsured diabetic patients in a community free clinic

Primary Author: Ramadas Balasubramanian, independent; Email: ramadasbalu@gmail.com

Additional Author(s):
S. Marie Dockery
Gracie Liem Galloway
James H. Cooke

Purpose: This healthcare facility is a stand-alone 501c3 non-profit free clinic providing medical care by volunteer healthcare professionals and laboratory services to low-income, uninsured patients with chronic health conditions including diabetes. The impact of the patient-centered approach on the A1C achievement in diabetic patients in this clinic from 2015 (baseline) was presented as a poster at the American Society of Health-System Pharmacists Midyear Clinical Meeting in Las Vegas in December 2016. This abstract provides a follow-up report on achieving A1C less than 7 per cent per American Diabetes Association (ADA) guidelines in the same patient population over 16 more months.

Methods: The 2015 baseline retrospective chart review study consisted of 59 patients with diabetes on standard therapies. However, 21 patients were lost to follow up in 2016 as they became eligible for medicaid, medicare and other reasons. So, the remaining 38 patients (23 females-mean age 54.3 years, range 32-77 years) were followed for 16 more months to evaluate the impact of the patient-centered service on A1C outcome. The most recent A1Cs as of 12-31-15 (baseline) and 4-30-17 (follow-up) were used. These 38 patients were grouped based on their A1Cs--baseline first and then in the follow-up--Group (Gp)-1-A1C less than 7, maintained less than 7, Gp-2-A1C less than 7 increased to more than or equal to 7, Gp-3-A1C remained more than or equal to 7, and Gp-4-A1C improved to less than 7. The clinic interventions included minimizing no-shows by phone calls, providing in-house medications, comprehensive medication therapy review, encouraging lifestyle improvement, and improving clinic-patient communications through a text-messaging software. Microsoft Excel-(R) was used to calculate percentages, means and standard deviation (SD), and chi-square statistic was used to measure the association of A1C with the services with P-less than 0.05 for significance. This study was exempt from Institutional Review Board approval.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: As of 4-30-17, the mean A1C for all 38 patients was 7.9 (range 5.6-13.5, SD 1.9) versus 2015 baseline mean A1C of 7.4 (range 5.5-12.2, SD 1.5) which did not meet the ADA guidelines. In the follow-up: 14 of 38 (36.8 per cent) patients had A1C less than 7 (Gp-1: 28.9 per cent maintained A1C less than 7, and Gp-4: 7.9 per cent improved A1C to less than 7). The remaining 24 of 38 (63.2 per cent) patients had A1C more than or equal to 7 (Gp-2: 21.1 per cent increased A1C to 7 or more from less than 7, and Gp-3: 42.1 per cent maintained A1C 7 or more). However, in 2015, 19 of 38 (50 per cent) patients had A1C less than 7 (Gp-1: 42.1 per cent maintained A1C less than 7, and Gp-4: 7.9 per cent improved A1C to less than 7). The remaining 19 of 38 (50 per cent) patients had A1C 7 or more (Gp-2: 2.6 per cent increased A1C to 7 or more from less than 7, and Gp-3: 47.4 per cent maintained A1C 7 or more). Overall, fewer patients achieved A1C less than 7 in the follow-up period versus baseline (P-more than 0.05-not significant).

Conclusion: Though the interdisciplinary patient-centered approach in the free clinic was helpful overall in managing patients with diabetes, A1C goal of less than 7 per ADA guidelines was not achieved in the follow-up period. So, there is certainly room to improve this quality outcome with other strategies including medication adherence, phone calls, group education and motivational interviewing to prevent microvascular complications in these patients.
Submission Category: Ambulatory Care

Session-Board Number: 7-002

Poster Title: Effect of clinical pharmacy services on diabetes outcomes at a federally qualified health center

Primary Author: Benjamin Chavez, University of Colorado Skaggs School of Pharmacy; Email: benjamin.chavez@ucdenver.edu

Additional Author(s):
Emily Kosirog
Marilyn Banh

Purpose: This study aims to measure the impact of a clinical pharmacy service on patients with diabetes in a Federally Qualified Health Center (FQHC). Patients are referred for one-on-one clinical pharmacy visits by their primary care provider to manage specific disease states, with the majority being for diabetes management. Pharmacists can initiate and modify medication therapy per collaborative practice agreements. The primary objective of this study was to assess the benefits of this clinical pharmacy service in patients with diabetes using hemoglobin A1C (HBA1c). A secondary objective was to assess benefits on blood pressure control in patients with diabetes.

Methods: The study was a retrospective analysis of patients seen by the clinical pharmacy service at a FQHC. Due to a large Hispanic population at this site, clinical pharmacists are bilingual and provide direct patient care in both English and Spanish. Patients included in the study were initially seen by the clinical pharmacy service between July 1, 2015 and March 31, 2016, they had a diagnosis of diabetes, had a HbA1c within 3 months prior to initial clinical pharmacy visit, and had at least one HbA1c after their first contact with pharmacy. Based on these criteria, a patient list was generated by the electronic medical record and manually refined. Individual patient charts were analyzed for changes in HbA1c and blood pressure, number of visits with PharmD, and insulin use. Data was manually collected through September 30, 2016. Changes in blood pressure were also observed for a subgroup of patients who had uncontrolled hypertension at baseline, defined as having a systolic blood pressure greater than 140 mmHg and/or a diastolic blood pressure greater than 90 mmHg. The study was approved by the Colorado Multiple Institutional Review Board.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** Two-hundred and eleven patients met inclusion criteria. They had a mean age of 55 years old, were 63 percent female, and 82 percent of Hispanic or Latino ethnicity. Approximately 53 percent preferred their care in Spanish, making this a unique patient population. The average pre-intervention HbA1c was 10.7 percent plus or minus 2.5 percent; the average post-intervention HbA1c was 9.3 percent plus or minus 2.1 percent. This decrease was statistically significant (p value less than 0.0001). Patients whose pre-intervention HbA1C was greater than 9 percent had a statistically greater decrease of 1.9 percent (p value less than 0.0001) compared to patients with a baseline HbA1C of less than 9 percent. There was a significant correlation between number of visits and HbA1C improvement. There was also a statistically significant blood pressure reduction in patients who were hypertensive when they began utilizing clinical pharmacy services. Sixty patients had uncontrolled hypertension prior to pharmacy intervention. Mean reduction of systolic blood pressure between pre- and post-pharmacy intervention was 14.3 mmHg plus or minus 13.7 mmHg (p value less than 0.0001). Mean reduction in diastolic blood pressure between pre- and post-pharmacy intervention was 4.5 mmHg plus or minus 7.2 mmHg, (p value less than 0.0001).

**Conclusion:** In patients with diabetes who had individual visits with clinical pharmacists, there was significant improvement in HbA1c and blood pressure. Data suggest that patients with an HbA1C greater than 9 percent prior to receiving pharmacy services may receive greater benefit. There is minimal published data on outcomes of clinical pharmacy services within FQHCs. These centers are well equipped to address social determinants of health, and serve primarily lower-income Americans, who are more than twice as likely to die from diabetes as those above the Federal Poverty Level. This collaborative care model and associated outcomes could be replicated at other institutions.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-003

Poster Title: Effectiveness of pharmaceutical care program on the COPD management: a before and after study

Primary Author: Lindemberg Costa, Federal University of Bahia, Brazil; Email: lindemberg.rn@gmail.com

Additional Author(s):
Charleston ribeiro
Antonio Lemos
Laira Lorena Yamamura
Eduardo Netto

Purpose: To evaluate the effectiveness of a pharmaceutical care based disease management program on dyspnea symptoms and quality of life (QoL) in patients with COPD in the Brazilian Health System setting.

Methods: This is a before and after study that comparing two strategies for COPD management (Program vs. ordinary public health system care). The study was conducted at Respira Bahia Program Outpatient Clinic, located in Specialized Hospital Octávio Mangabeira, in Salvador, Northeastern, Brazil. were included in the study patients with moderate to very severe COPD based on spirometric diagnosis. The interventions of the program consisted in the free and continuous supply of medicines associated to pharmaceutical care. The effectiveness of interventions was evaluated through patients’ dyspnea symptoms (modified medical research council score, mMRC - 2) and QoL, measured by airways questionnaire 20 (AQ20), comparing baseline and 12 months after admission of patients.

Results: A total of 206 eligible patients were included between June and october 2012. In most of the patients (mean age was 64.9 years and and 68.9% were mens), the COPD was classified as being severe (47.6%) or very severe (27.2%). There was a significant reduction (p < 0.001) of 30,9% in the frequency of symptomatic patients. We identify significant improvement in AQ20 score after the intervention (p < 0.001).
**Conclusion:** A pharmaceutical care based disease management program with free and continuous dispensing of medicines is an effective strategy to improve the well-being and symptoms of patients with COPD.
Submission Category: Ambulatory Care

Session-Board Number: 7-004

Poster Title: Assessing patient perspective regarding bedtime dosing of antihypertensive medications

Primary Author: Danielle Danso, The University of Findlay; Email: dansod@findlay.edu

Additional Author(s):
Ashley Anugwom
Kihara Couvertier
Omuwa Kerobo
Laura Perry

Purpose: When managing hypertension, practitioners often do not consider aspects of circadian variability of blood pressure. During circadian rhythm, blood pressure is typically lower at night, termed dipping status. Non-dippers are patients with a higher nighttime blood pressure. A recent study by Hermida, et al. (MAPEC study) determined that, when compared to morning dosing, bedtime dosing of at least one antihypertensive medication improved overall blood pressure control and significantly reduced cardiovascular disease risk. This benefit was also seen in chronic kidney disease and diabetes patients. Therefore, the American Diabetes Association recommends consideration of bedtime dosing of at least one antihypertensive medication. The purpose of this study was to evaluate the viewpoints of patients with hypertension regarding bedtime dosing of antihypertensive medications.

Methods: A telephone questionnaire was administered to hypertensive patients at a multidisciplinary private practice clinic. Patients above the age of 18 with a documented diagnosis of hypertension were eligible for inclusion. Patients younger than age 18, pregnant, unable to speak English, or cognitively impaired were excluded from the study. Verbal informed consent was obtained prior to administering the survey and all patient information was de-identified. Primary end point: time of day patients take antihypertensive medications. Secondary endpoints: adherence to current antihypertensive regimen and potential barriers of adherence to bedtime dosing.

Results: A total of 139 responses were collected. More patients reported taking at least one medication in the morning, compared to taking at least one medication at bedtime, 76 percent and 24 percent respectively. When evaluating patient reported adherence to bedtime vs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
morning dosing, adherence was slightly lower for bedtime dosing (87 percent vs 92 percent). Of those who only take antihypertensive medications in the morning, 73 percent indicated that bedtime dosing would not affect how often they miss a dose of their medication. The most common patient reported barriers to adherence for bedtime dosing were forgetting to take the medications and side effects. Limitations to this study were a small sample size and potential for patient recall and reporting bias when assessing adherence.

**Conclusion:** This study suggests that, although fewer patients report taking at least one antihypertensive medication at bedtime, patient reported compliance was relatively high for bedtime dosing. Changing the administration time of one antihypertensive medication is a simple, cost-effective strategy to improve cardiovascular disease risk. Pharmacists should discuss the potential cardiovascular benefits of bedtime dosing of antihypertensive medications with patients and prescribers. Future studies should be conducted to further explore patient adherence with bedtime dosing of antihypertensive medications as well as physician’s willingness to prescribe antihypertensive medications at bedtime.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-005

Poster Title: Reduction in concentrated insulin usage in a type 2 diabetic after intiation of SGLT-2 inhibitor

Primary Author: Staci Dotson, St. Rita's Medical Center; Email: srdotson@mercy.com

Purpose: Sodium-glucose co-transporter 2 (SGLT2) inhibitors are the newest class of medications used to treat diabetes (specifically, indicated for use in patients with type 2 diabetes). These medications inhibit the reabsorption of glucose from the kidneys and will therefore result in lower blood glucose levels. Side effects of these drugs can include hypotension, myocytic urinary tract infections, hyperkalemia and renal impairment. These medications can also have a diuretic effect, resulting in beneficial lowering of blood pressure and weight, although these effects can be limited. The resultant reduction in blood glucose levels from these medications can necessitate adjustment of other antidiabetic medications. This case report specifically involves the reduction in concentrated U500 regular insulin dosage upon initiation of the SGLT2 inhibitor, canagliflozin. The patient in this case report has been a type 2 diabetic for over 30 years. Her diabetic therapy prior to initiation of the SGLT2 included approximately 350 units of concentrated U500 insulin daily. Her blood glucose levels showed improvement after one week of therapy, resulting in approximately a 24% decrease in insulin dose to 265 units daily. One year post initiation and subsequent titration of canagliflozin, the patient is still on the reduced dose of concentrated insulin of approximately 225 units daily (total reduction of approximately 36%). The patient did not experience any significant decrease in blood pressure but did see modest improvement in weight. The patient lost 10 pounds in the 3 months (5% of her body weight) following initiation of SGLT2 inhibitor therapy. The patient had three instances of myocytic urinary tract infection, treated successfully with fluconazole, not deemed serious enough to outweigh the benefit of therapy. Her electrolytes and renal function remained stable. As shown with this case, SGLT2 inhibitors can potentiate the risk of hypoglycemia, especially when used with other medications with similar side effects (e.g. insulin). Clinical pharmacists must be ready to adjust diabetic medications, especially highly concentrated insulin, to prevent hypoglycemic events.
Submission Category: Ambulatory Care

Session-Board Number: 7-006

Poster Title: Opioid prescribing: can we write for less? a retrospective analysis of opioid prescription requests for acute pain in a multisite, ambulatory care organization

Primary Author: Semie Durrani, BayCare; Email: sdurrani924@gmail.com

Additional Author (s):
Kathy Zaiken

Purpose: On March 14, 2016, the Commonwealth of Massachusetts passed a law to amend MGL 94C Section 18 which states that initial prescriptions for opioids may not exceed more than a 7 day supply. Studies have shown roughly 70% of patients prescribed an opioid had medication left over. Furthermore, on average, the days’ supply remaining on opioids that were returned to a ‘take-back’ program was 3.3 days. The objective of this study is to determine the request rate for additional opioid prescriptions compared to the original prescribed days’ supply. This is an outcome that has not been studied.

Methods: The Institutional Review Board at MCPHS University has approved this study. Atri Health patients who received an initial prescription for a short-acting oral opioid indicated for acute pain management that was a 14 day supply or less between May 1, 2016 and October 1, 2016 will be included in this study. A retrospective chart review will be completed by the primary investigator. Patients will be excluded if they are receiving palliative care, have a diagnosis of cancer, chronic prescription for opioids, a second separate pain episode within 30 days, if we cannot determine if the prescription is the first or second prescription, or if the prescription was prescribed for a condition other than acute pain. The primary outcome will be to determine the percentage of additional patient short-acting opioid prescription requests after an initial prescription for acute pain management was prescribed. We will also aim to determine if certain patient characteristics such as; substance/alcohol abuse, documented history of smoking and age have an effect on the request for additional opioid prescriptions.

Results: A total of 350 patients met the inclusion criteria and were included in the final analysis. On average, patients were written a 4 day supply of opioids. The overall percentage of patients calling back requesting medication for pain management was 13% (46/350). Of the 46 patients who called back requesting more medication, 15 patients received a second opioid prescription for acute pain management, 4% (15/350). It was found that patients who received a 6-7 day

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
supply of opioids were less likely to call back requesting more medication than patients who received a 1-3 day supply of opioids (OR 0.10; 0.01-0.85). Patients who received a 4-5 day supply of opioids were trending towards being less likely to call back requesting more pain medication than patients who received a 1-3 day supply of opioids (OR 0.41; 0.17-1.00). When looking at concomitant medications that patients were taking, gabapentin was found to be a risk factor for patients to call back requesting more pain medication (OR 2.07; 2.08-19.58). Additionally, patients who were labeled as a former smoker were more likely to call back requesting more pain medication than patients who were non-smokers (OR 2.79; 1.15-6.78).

**Conclusion:** At Atrius Health, roughly 13% of patients are requesting more pain medications after being prescribed a short-acting opioid for acute pain management. Based on this study, shorter day supplies of opioids may lead to more patients calling back requesting more prescriptions. The results from this study show that gabapentin use may be a risk factor for requesting and receiving a second prescription. Results of this study also show that patients who were former smokers may be at a higher risk for requesting more pain medication. However, further studies will be needed to evaluate risk factors for patients requesting and receiving more pain medication.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-007

Poster Title: Pharmacist managed anemia clinic improves guideline adherence for darbepoetin

Primary Author: Hugh Easley, Kalispell Regional Healthcare; Email: heasley@krmc.org

Additional Author (s):
Michael Dotter
Hanna Cattron
Kaci Wilhelm

Purpose: The use of darbepoetin for anemia in chronic kidney disease patients is complex and requires close monitoring to achieve optimal outcomes and prevent adverse effects. Studies have reported an increased risk of death, serious cardiovascular events and stroke when administering erythropoiesis stimulating agents (ESA) to target hemoglobin (Hgb) > 11 g/dL. Due to this complexity, intervention by a pharmacist was requested. The purpose of this abstract is to report on the outcomes of a pharmacist managed anemia clinic in non-dialysis chronic kidney disease patients at Kalispell Regional Medical Center in Northwest Montana.

Methods: This is a retrospective review of patients receiving darbepoetin as outpatients for non-dialysis chronic kidney disease. The primary objective is to determine the % of doses administered complying with guidelines. Secondary objectives include cost of inappropriate doses, % compliance for IV iron administration and costs for inappropriate doses. In January 2016, guidelines were implemented at Kalispell Regional Medical Center to standardize and formalize the pharmacist’s role in managing darbepoetin and IV iron replacement in chronic kidney disease outpatients. As part of the guidelines, pharmacists may order laboratory tests, adjust dosages or frequency, and monitor for adverse effects. Orders for darbepoetin are initiated by the physician and then managed by the pharmacist. Per protocol, darbepoetin may be initiated if Hgb < 10g/dL within 7 days of the initial order and dosage adjustments are managed by the pharmacist based laboratory values. ESAs doses are held for Hgb - 11g/dL. Iron replacement therapy is indicated for Ferritin ≤100 ng/mL or TSAT ≤ 20%. Ferritin and TSAT are repeated 1 month after an iron replacement dose or every 3 months for patients not receiving iron replacement. Darbepoetin costs are based on acquisition costs calculated as weighted average for the respective time frame.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** In the pre-intervention period, 15 patients received darbepoetin and a total of 101 doses were administered. In the post-intervention period, 35 patients received darbepoetin and a total of 180 doses were administered. The % of doses not complying with established guidelines were 31.7% in the pre-intervention period and 3.8% in the post-intervention period. The primary reason for non-compliant doses was administering darbepoetin when Hgb - 11g/dL. The cost of non-compliant doses was $8,368.02 for pre-intervention period and $1,705.46 for post-intervention period. Iron replacement was non-compliant in 26.3% of doses ordered in pre-implementation compared to 14.9%. The primary reason for non-compliant iron doses was incomplete laboratory evaluation. 75% of patients in the post-implementation phase and 93% in the pre-implementation phase were insured by Medicare or Medicaid.

**Conclusion:** Pharmacist management of darbepoetin and iron replacement therapy improved guideline compliance in non-dialysis chronic kidney disease outpatients. The number of non-compliant doses of both darbepoetin and iron were reduced. Costs of non-compliant doses were also reduced. In addition, a subjective decrease in chair time was observed in the post-implementation phase as 77% of patients had labs drawn prior to the day of darbepoetin administration. Physician satisfaction is very high based on self-reporting. The limitations include non-randomized, retrospective design and lack of patient specific reimbursement data. Further study is warranted on the impact on reimbursement in the pharmacist managed anemia clinic.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-008

Poster Title: Implementation of a patient medication assistance program for hospital discharge prescriptions

Primary Author: Reba Forbess, Houston Methodist Willowbrook; Email: raforbess@houstonmethodist.org

Additional Author (s):
Chrestien Smith
Edith Veltz
Wesley Ventress

Purpose: There are many patients who cannot afford their medications or have a high degree of difficulty navigating the restrictions placed on them by insurance companies. It is as much the healthcare provider’s responsibility to make sure that a patient can obtain a medication as it is to prescribe the right medication for the patient. Cost and insurance restrictions on outpatient medications must be reviewed as part of the discharge process for hospitalized patients. To facilitate this process, a program was established to review the financial impact of discharge prescriptions on patients in order to ensure continuation of medications on an outpatient basis.

Methods: Seven medications were selected for the initial review, focusing on anticoagulants and antibiotics. Pharmacy technicians would speak to patients on these medications regarding their medication history and insurance status. The patient’s insurance company would be contacted to determine coverage. In collaboration with the physician, the pharmacist would then take steps to ensure that the patient could afford and receive the appropriate treatment by either financial assistance, prior authorization and/or switch to a more affordable medication.

Results: During the initial six-month implementation period, two-hundred fifteen patients were seen. The majority of the patients seen were Medicare patients at fifty-nine percent. The majority of the prescriptions reviewed were for rivaroxaban (anticoagulant) and linezolid (antibiotic). Thirty-five prior authorizations were completed, out of which seventy-six percent were approved and nineteen percent were changed to more affordable alternatives. In addition to processing prior authorizations, one-hundred fifteen trial cards and seventy-six co-

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
pay/assistance cards given to patients. This resulted in thousands of dollars in savings for patients.

**Conclusion:** This program showed that pharmacy can play a major role in assisting patients in making sure they have access to appropriate medications, as well as decreasing the time the prescriber spends on navigating the approval process.
Submission Category: Ambulatory Care

Session-Board Number: 7-009

Poster Title: Assessment of osteoporosis daily life style habits among elderly patients

Primary Author: Abed Al-Karim Hazimeh, LIU; Email: abedalkarim.hazimeh@gmail.com

Additional Author(s):
Sahar Obeid
Diana Malaeb

Purpose: Osteoporosis is a common chronic skeletal disease in elderly population with an increasing incidence worldwide. It is a very complex disease where many different factors influence the rate of bone loss. In addition, is a growing major public health problem with impact that crosses medical, social, and economic lines. In Lebanon there is a lack of knowledge about this disease and its treatment. The aim of this study is to evaluate the daily life style factors and assess the associated risk factors as co-morbidities and drugs among Lebanese elderly patients.

Methods: This was a multicenter descriptive study conducted in community pharmacies distributed in different Lebanese geographic areas from September till December 2016. The inclusion criteria included men and women aged 45 years and above were enrolled if they have had any associated risk factors as co-morbidities and drugs, daily life style as physical activity and diet, smoker, alcohol consumption, and receiving calcium and vitamin D supplements. The exclusion criteria included adults aged below forty five years. Standardized questionnaires were distributed to all patients fulfilling the inclusion criteria to document their daily lifestyle factors and assess the associated risk factors as co-morbidities and drugs. The data was filled by trained personnel during a face-to-face interview with the community patients. The outcome of the study was to evaluate patients’ daily lifestyle factors, and the associated risk factors as co-morbidities and drugs. Institutional review board approved the study and written informed consent was obtained from all participants. The statistical test was analyzed by the SPSS version 23.0.

Results: From a total of 450 patients who were screened for possible enrollment in the study, 300 patients met the inclusion criteria and were included. The most common prevalent disease was hypertension (82.7%), followed by diabetes mellitus (65%) and dyslipidemia (47.7%). As for drugs the most common consumed was proton pump inhibitors (96.7%). With respect to daily
adherence to well-balanced diet, only (52.3%) consume breakfast, (56.7%) drink milk every day, and (19%) adhere to physical activity, (65%) smoke nicotine, and (20.3%) drink alcohol. Also from these patients, only (49.3%) take calcium supplement and (66.7%) vitamin D supplement.

**Conclusion:** This study highlights that most elderly patients lack the necessary information about the lifestyle factors that affect osteoporosis development. Thus, the role of the pharmacist is a continuous process that includes disease prevention and treatment. The pharmacist has a very important role in providing the education about factors that might affect disease occurrence and raising awareness about the importance of lifestyle modifications.
Submission Category: Ambulatory Care

Session-Board Number: 7-010

Poster Title: A retrospective evaluation of pneumococcal vaccination administration in a human immunodeficiency virus clinic

Primary Author: Alexis Horace, University of Louisiana at Monroe School of Pharmacy; Email: horace@ulm.edu

Purpose: Streptococcus pneumoniae is considered a leading infectious cause of serious illness for adults 65 years of age and in immunocompromised patients. Currently, there are two vaccines used to prevent infections by Streptococcus; the 13-valent pneumococcal conjugate vaccine (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PPSV23). The Advisory Committee on Immunization Practices guidelines recommends a complex vaccination schedule using both pneumococcal vaccines for immunocompromised patients, which increases the risk of confusion for physicians and clinic staff. The objective of this research was to identify the rates of guideline driven pneumococcal vaccination in an human immunodeficiency virus (HIV) clinic.

Methods: The institutional review board the University of Louisiana at Monroe School of Pharmacy and Our Lady of the Lake Regional Medical Center (OLOLRMC) approved this retrospective evaluation. A total of 412 patient electronic medical charts from active physician patient lists were reviewed at the LSU Midcity Clinic: A Division of OLOLRMC, Early Intervention Clinic between October 2016 - January 2017. Patients excluded from the study were those < 18 years of age and pregnant/lactating women. Demographic data included age, gender, possible asthma diagnosis, smoking status, previous pneumococcal infection, most recent CD4+ cell count, and most recent viral load. Data were collected regarding the sequencing and administration of PCV13 and PPSV23 in two divided groups. The first group consisted of patients - 65 years of age and and the second group consisted of patients 18-64 years of age. Data were analyzed using descriptive statistics.

Results: Of the 412 patients evaluated for this study, 231 (56.07%) were male and 181 (43.93%) were female. Sixty-two (15.05%) patients had a previous hospitalization for pneumonia listed in their medical chart. Of the 18 patients that were - 65 years of age, 6 (33.3%) received a dose of PCV13 at the time of the study. For 3 (16.7%) patients who received PPSV23 prior to turning 65 years of age, it had been >5 years since their last PPSV23 vaccination. In the 18-64 years of age group (n = 394), 221 (56.09%) of the patients received either PCV13 or PPSV23 irrespective of
sequencing. A total of 282 (71.57%) of the patients had not received a dose of PCV13 and a total of 249 (63.2%) of patients had not received their first dose of PPSV23. For those patients who received PPSV23 (n = 145), 19 (13.1%) received the vaccination after 5 years, 32 (22.07%) did not receive the vaccination after 5 years, and 94 (64.82%) were not due for vaccination. For that same patient group, 110 (75.8%) had not receive PCV13 prior to vaccination with PPSV23.

**Conclusion:** Rates of pneumococcal vaccination for this particular HIV clinic are very low and much improvement is needed to provide our patients with the best protection against Streptococcus pneumoniae. Physician and clinic staff education, flow charts outlining the sequencing of pneumococcal administration, and a pharmacist’s involvement in making patient specific recommendations may help to improve vaccination rates. An interdisciplinary approach will be necessary to fully address these results.
**Submission Category:** Ambulatory Care

**Session-Board Number:** 7-011

**Poster Title:** Prevalence of influenza vaccination and attitude towards it in the Lebanese population

**Primary Author:** Hanane Ismail, Lebanese International University; **Email:** hananeis92@gmail.com

**Additional Author (s):**
Mehsen Atwi
Marwan Akel
Faraj Saade
Jihan Safwan Saade

**Purpose:** Influenza is an acute respiratory illness associated with high mortality and high hospitalization rates. It ranks eighth among most common leading causes of death in 2014. Annual vaccination prevents influenza transmission during the flu season and provides protection especially to high-risk individuals. The aim of this study is to evaluate the prevalence of influenza vaccination in 2015 among the Lebanese population and assess their attitude towards the flu vaccine.

**Methods:** A cross-sectional, observational survey was conducted from February till May 2016 involving the Lebanese population. The study was approved by the Institutional Review Board of the school of pharmacy at the Lebanese International University. Participants from different regions around Lebanon who were 18 years and above were included in the study to fill a 43-item questionnaire to state their influenza vaccination status, their knowledge and attitude towards it. All statistical analysis was performed using SPSS version 23 and presented as frequency, percentage, means, and standard deviations. A Pearson chi square p-value of less than 0.05 was considered to indicate statistical significance and binary logistic regression identified risk factors that were associated with an increased vaccination rate.

**Results:** Among 1223 participants enrolled in the study, the vaccination rate for 2015 was only 14%. The collected data showed that the mean age was 33.5 years with equal distribution between males and females and 53% were smokers. Results showed that only dyslipidemia [Odd’s Ratio (OR), 2.436] increased vaccination among the socio-demographic risk factors. The most common reason for vaccination was “vaccination important to protect patients from flu

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
infection” while that of non-vaccination was “considering the flu as a mild disease”. 51.6% had 1-2 episodes of flu and 16% had 3 or more episodes. Of those, 74.2% sought treatment whereby 89% chose an over the counter flu remedy whereas 34.7% preferred an antibiotic. The history of at least one flu vaccine intake demonstrated a significant association and increased vaccination (p-value < 0.001; OR = 43.28). Regarding the knowledge and attitude towards the vaccine, increased risk of complication to pregnant females due to flu (p-value = 0.4; OR = 0.46), the optimal vaccination time (p-value < 0.001; OR = 3.54), and awareness to the infection (p-value = 0.01; OR = 0.54) revealed a significant correlation with the flu vaccination in 2015.

**Conclusion:** Misconceptions and lack of knowledge towards influenza vaccination resulted in sub-optimal vaccination rates among the Lebanese population. This study emphasizes the compelling need for spreading public awareness in Lebanon regarding the efficacy and benefits of seasonal influenza vaccination beginning with the health care professional’s consultations to improve vaccination chances.
Submission Category: Ambulatory Care

Session-Board Number: 7-012

Poster Title: Cultural perspectives influencing medication adherence in South Asian immigrants with diabetes mellitus and/or cardiovascular disease

Primary Author: Amna Jamil, University of Pittsburgh School of Pharmacy; Email: amnajamils@yahoo.com

Additional Author(s):
Lauren Jonkman
Luke Jennings
Michelle Miller
Sharon Connor

Purpose: South Asians (SAs) account for 60% of the world’s cardiovascular disease (CVD) and have the highest death rate from CVD amongst ethnic groups in the US. Globally, 130 million SAs have diabetes mellitus (DM) and there are estimates that Indians have the highest prevalence of DM in the US. Although retrospective cohort studies indicate a significantly decreased adherence to medications for CVD in SA immigrants, there is limited data exploring the reasons for this non-adherence. The purpose of this project is to evaluate how cultural perspectives of SA immigrants in the US impact adherence to medications for DM and CVD.

Methods: This qualitative research was approved by the IRB and recruited SA immigrants with CVD and/or DM from free clinics and community health centers in Pittsburgh to participate in semi-structured interviews. Interviews were conducted in English, Hindi or Urdu. Participants also completed the Voils Adherence Scale, a 5-point scale. Interviews were audio recorded, transcribed verbatim, and translated into English. A codebook was developed utilizing the conceptual frameworks of the Patient Explanatory Model and the HOPE questions. Codes were reviewed to detect patterns and final data analysis focused on identifying overarching themes.

Results: Twelve participants were interviewed. Of those, four emigrated from India, seven from Pakistan and one from Bangladesh. The average number of years in the US was 24 (range 1-45). Three practiced Hinduism and nine practiced Islam. Half were female with an average age of 63 (range 49-75). Three-fourths had Type 2 DM, while the rest also had CVD. Average adherence score was 1.36 (range 1-2.33) with 1 being perfect adherence. Five overarching themes were identified after analysis: 1) participants are motivated by the results of labwork
and self-monitoring due to a desire to prevent complications and improve quality of life; 2) participants are motivated by a desire for autonomy and the ability to self-manage their disease states; 3) adherence improved when participants engaged in collaborative relationships with healthcare providers and family members; 4) participants will try complementary/alternative medicines but remain overall uncertain of their efficacy; and 5) religious/spiritual beliefs encouraged a desire to care for self, although participants felt they could make their own decisions about medication use.

**Conclusion:** Health care providers should consider the use of self-monitoring as a tool to empower patients to better manage their disease states. Family members may play an important role, and should be involved to strengthen the support system available to a patient. Participants expressed a desire for autonomy and self-managing their disease states, and health-care providers should seek to cultivate collaborative and trusting relationships with their patients in order to bridge gaps in communication. Future directions include limiting recruitment to more recent immigrants (i.e. less than five years) as well as focusing on participants with documented non-adherence to chronic medications.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-013

Poster Title: Development of a nutrition education program for a low health literacy population in a rural, underserved community: a pilot study

Primary Author: Karen Kier, Ohio Northern University; Email: k-kier@onu.edu

Additional Author(s):
Curtis Warren
Emily Loudermilk
Amy Fanous
Kara Kubbs

Purpose: The county is a small farming community with 3.4 percent of the population having less than a ninth-grade education. Cancer mortality in the county has been on the rise since 2012 and is now above the state average. The college of pharmacy has a rural, mobile health clinic for education and screening within the county. The purpose was to utilize a nationally recognized low literacy nutritional education program as part of a cancer prevention educational outreach. The pilot program will use words at or below the fifth-grade reading level.

Methods: The IRB approved educational pilot program was tested on college students (n equals 23). The program consisted of a slide presentation breaking down the pigment and preventative quality of foods by pigment/color categories. The Physicians Committee for Responsible Medicine gave approval for the rural clinic to use their educational materials for the pilot program. Food pigments and associated substances were categorized as: red and lycopene, orange and beta-carotene, yellow-orange and vitamin C, green and folate, green-white and indoles, white-green and allyl sulfides, blue and anthocyanins, red-purple and resveratrol, brown and fiber. The participants were tested with a pre-test and post-test methodology. The pre-test contained five questions that were used to assess the participant’s previous knowledge on the subject. The post-test contained the same five pre-test questions to test for the learning quality of the program as well as five additional questions to examine if the educational program was successful in covering all points. Each question had four answer choices and the testing was conducted through polling software. The Wilcoxon signed-rank test was used for nonparametric statistical analysis for the paired pre-test, post-test analysis of the same questions. Descriptive statistics were used to describe the other variables.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: The first paired statistical testing analyzed if learning was significant from the five pre-test questions and the very same five questions from the post-test. Pre-test scored showed an average of eight of the twenty-three participants got the questions correct while an average of eighteen of the twenty-three had the correct answers on the post-test. The results for learning from pre-test to post-test was significant with a p value of 0.009. The second set of questions on the post-test were unique and had not been asked on the pre-test. The results showed an average of seventeen participants got the questions correct for these questions. These results are consistent with the improvement in knowledge base from the pre-test to post-test questions. So participants did understand the material even when unique questions were asked. Within the results, the researchers were able to detect two areas of confusion for the participants. The slides on the green and orange hues may need to be refined and re-evaluated before presenting the program to the community.

Conclusion: The pilot program was successfully in understanding the dynamics and the ability to enhance education. The simplicity of matching food colors for cancer prevention helps to provide a message that is easily understood. The program noted two areas that caused problems for the students so the orange and green color portions will need to be reworked. The next step will be to implement this program within community. The clinic recently purchased a bus with the technology to show slide presentations and video. The goal is to evaluate this program for its ability to educate in a low literacy program.
Submission Category: Ambulatory Care

Session-Board Number: 7-014

Poster Title: Marijuana cessation support group under pharmacist auspice at university outpatient psychiatric clinic

Primary Author: Nicholas Kim, UIC College of Pharmacy; Email: nkim39@uic.edu

Additional Author(s):
Melissa Chaung
Shiyun Kim

Purpose: Marijuana use is frequently observed among individuals with psychiatric diagnosis. Marijuana is a commonly used illicit drug in the United States. Face-to-face counseling demonstrates lowest reach and intervention with low efficacy. Therefore, support group approach is utilized to attract patients to attend the session. Through the marijuana support group and educational materials, patients will be more informed about the biological and psychosocial effects of marijuana. Patients will have the tools to be motivated and take additional steps toward marijuana cessation.

Methods: The marijuana cessation support group was initiated by a clinical pharmacist covering the substance abuse recovery outpatient clinic to support patients interested in quitting. The group is offered once a month for an hour and is open to all patients in the outpatient psychiatry clinic. Two third-year pharmacy students interested in mental health were recruited to help facilitate and create patient-friendly education materials for the group. A structured interview process is scheduled for thirty minutes during the group session. The clinical interview format was consolidated from the Brief Counseling for Marijuana Dependence written by Substance Abuse and Mental Health Services Administration (SAMHSA). This interview includes a marijuana problem scale, reasons for quitting, and a self-efficacy questionnaire. The interactive session has been designed for the patient to reflect on social and behavioral effects due to use of marijuana. After reflection, the patients are exposed to a listening session and a self-monitoring plan designed to assist the patient in preventing and coping with emotional triggers. In addition to the interview, patient education materials have been prepared to reinforce ideas and goals introduced during the interview. Education materials include information from the National Institute on Drug Abuse, SAMHSA and Marijuana Anonymous. With these materials, patients will be more informed and will be able to track their daily use of marijuana.
**Results:** Implementing the group setting promotes a patient-friendly environment for better participation by a specific group of patients. These sessions offer additional support and information about the challenges and benefits of abstinence. Questionnaires utilized in this group setting give detailed response to patients on how marijuana use personally affects them; these questionnaires can be used for self-reflection. At this time, most patients attending the program are not prepared to take action; they attend as recommended by their psychiatrist or are interested in how to cope with cessation. Currently, the group struggles with low turnout; attendees lose interest or are not ready for cessation; patient recruitment is a challenge for this program.

**Conclusion:** By participating in this marijuana support group and through use of educational materials, patients will be more informed about the biological and psychosocial effects of marijuana. Patients will have the tools to be motivated and take a step towards marijuana cessation. As the pharmacist plays a vital role in this setting, patients may demonstrate improved treatment, satisfaction, and greater acceptance toward continuity of care.
**Submission Category:** Ambulatory Care

**Session-Board Number:** 7-015

**Poster Title:** Attitudes and beliefs about insulin therapy in patients with diabetes in a patient-centered medical home

**Primary Author:** Rory Kim, University of Southern California School of Pharmacy; Email: rocallag@usc.edu

**Additional Author(s):**
Geoffrey Joyce
Steven Chen
Mimi Lou
Rocio Ribero

**Purpose:** In order to achieve and maintain glycemic control, patients with diabetes must receive and adhere to appropriate medication regimens. For many patients the timely initiation of insulin therapy is necessary to prevent complications, however patients may resist the initiation of insulin or may not adhere to prescribed regimens. Evidence has shown that clinical outcomes improve when pharmacists are integrated into the care team, however the impact of pharmacists on insulin beliefs has not been assessed. The purpose of this study is to investigate the impact of the clinical pharmacy team on patient attitudes about insulin.

**Methods:** This is an IRB-approved prospective survey study of adult patients in a patient-centered medical home. Patients were eligible to complete the survey if they were 18 years of age or older and had been diagnosed with diabetes. Patients in the treatment group had to have had a minimum of two prior appointments with the clinical pharmacy team and patients in the control group had to have had two appointments with a primary care provider in the clinic, but no contact with the pharmacy team. The survey instrument utilized the insulin treatment appraisal scale (ITAS), a validated survey used to assess patients’ attitudes and beliefs about insulin therapy. ITAS is a 20 item survey with 16 negative statements about insulin and 4 positive statements to which respondents indicate their level of agreement using a 5 point likert scale (strongly disagree=1, strongly agree=5). Patients were also questioned about adherence to diabetes medications.

**Results:** 197 patients in the treatment group and 168 patients in the control group completed surveys. Baseline demographics were similar between groups and patients were predominantly
Hispanic, female, low income, and with a mean age in the mid-50s. The mean total negative ITAS score was higher for the insulin naïve group compared to the insulin-treated group (50.9 vs. 42.5, p < 0.0001). The mean total positive ITAS score was higher for the insulin-treated group compared to the insulin naïve group (15.6 vs. 14.1, p < 0.0001). The mean ITAS negative and positive scores were not statistically significantly different between the treatment and control groups. Insulin-treated patients in the treatment group indicated higher level of agreement with the statement that “using insulin helps prevent complications of diabetes”, (4.1 vs. 3.8, p=0.03). Patients in the control group reported higher levels of agreement with several statements referring to a negative impact on lifestyle compared to the treatment group. Treatment group patients self-reported fewer missed insulin doses (1.2 vs. 3.6, p < 0.001) per week. The Wilcoxon Mann-Whitney test was used for continuous variable comparison and the Chi-square test was used for categorical variable comparison.

**Conclusion:** Patients currently using insulin have more positive associations and lower negative beliefs about insulin overall regardless of their interaction with the clinical pharmacy team. Patients who have been prescribed insulin and are being managed by the clinical pharmacy team, report better adherence to their insulin regimens. These patients may also perceive more positive effects of insulin and may feel insulin is less of a burden on their lifestyle than patients who did not see the clinical pharmacy team. Clinical pharmacy services may contribute to improved insulin adherence by assisting patients with insulin management and providing education on benefits of insulin.
Submission Category: Ambulatory Care

Session-Board Number: 7-016

Poster Title: Impact of pharmacist home visits on the readmission rate of a community health system

Primary Author: Amy Lemieux, Hallmark Health System; Email: alemieux@hallmarkhealth.org

Additional Author (s):
Ruchit Marfatia
Nicole Clark

Purpose: One in five Medicare patients is readmitted to a hospital within 30 days of discharge. The length of stay of readmitted patients is on average longer than the length of stay of hospitalized patients with the same diagnoses and patient satisfaction rates are much lower in patients that require readmission. With nearly two-thirds of post discharge adverse events attributed to medications, it is a reasonable hypothesis that pharmacists have an integral role preventing unnecessary hospital readmissions. This examines how pharmacist home visits impacted the readmission rate of the target population on a care transition team.

Methods: This is a retrospective cohort study comparing the readmission rate of patients with intervention by pharmacy to patients without intervention by pharmacy from January 28th 2015 to January 28th 2017. The primary endpoint was to determine whether a difference exists in hospital readmission rates at 30 days post discharge between patients who were contacted by a pharmacist and those that were not. Secondary endpoint was to determine if there was a difference in outcomes between patients that were contacted via phone versus those patients that were visited in their home by a pharmacist. Patients were included if they were 60 years of age or older with Medicare and admitted to a community health system. Patients were excluded if they had been hospitalized in the prior six-month period. Each discharged patient’s medication list was reviewed by a pharmacist, who performed medication therapy management assessment to identify any drug related issues that could potentially lead to readmission. Any high risk patients identified by the pharmacy designees were called and a home visit was offered. In addition, both Transition Facilitators and Nurse Practitioners submitted referrals in response to patient request or following identification of drug related issues. If a patient was readmitted within 30 days, the process was repeated.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** From January 28th, 2015 to January 28th, 2017 4096 patient encounters were recorded in the Care Transition Program. If a patient was readmitted within the 30 day period following discharge or after six months, they were counted as a new encounter. Several patients required multiple home visits for a total of 167 home visits recorded for a total of 517 pharmacy outreaches completed (32.3% home visits and 67.4% phone consults). Of the 4096 patients, 436 patients were readmitted within a 30 day period. This did not include Emergency Room Visits or Observation Visits and represents a 10.64% readmission rate. Of the 4096 patients, 460 patients were outreached by pharmacy (11.2%). Of the 460 patients, 350 received phone consults and 110 received pharmacy home visits. Several patients required multiple home visits for a total of 167 home visits. There was a total of 517 pharmacy outreaches completed (32.3% home visits and 67.4% phone consults). In the two year study period, 28 patients were readmitted following pharmacy outreach representing a 6% readmission rate. Following a pharmacy home visit, 4 patients were readmitted, representing a 0.9% readmission rate. The primary endpoint will be evaluated using Chi-square test at the level of significance alpha=0.05.

**Conclusion:** Pharmacists have an opportunity prevent unnecessary hospital readmissions through pharmacy home visits. Many readmissions are preventable and result in unnecessary health expenditures estimated at nearly 17 billion dollars annually. The addition of a pharmacist on a care transition team impacted the readmission rate of our target population. The readmission rate appeared considerably lower when a pharmacist performed a home visit as compared to a phone call (0.9% versus 6%). This novel use of a pharmacist has the potential to change the traditional role of the pharmacist on a care transition team to include pharmacist home visits.
Submission Category: Ambulatory Care

Session-Board Number: 7-017

Poster Title: Implementation of a clinical pharmacy driven cardiovascular risk review service: evaluating provider receptiveness to passive recommendations

Primary Author: Brody Maack, North Dakota State University; Email: brody.maack@ndsu.edu

Additional Author (s):
Alyssa Selinger

Purpose: Develop a consistent method of reviewing 10-year risk for atherosclerotic cardiovascular disease (ASCVD) utilizing pharmacy resources to assist providers through identifying statin eligibility and appropriateness among patients with and without pre-existing cardiovascular disease. The ASCVD Risk Review Service utilizes a risk estimator tool, Pooled Cohort Equations (PCE), following the 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults. Provider receptiveness of the service was evaluated through review of data focused on acceptance of recommendations made. Guideline adherence to statin prescribing at baseline was also explored.

Methods: A prospective observational study was done at a federally qualified health center in the Midwestern US from August 2014 to April 2016, with institutional review board approval obtained. Advanced pharmacy practice experience students identified patients with scheduled primary provider visits in the upcoming week. Eligible patients included: age 21 years and older, not currently pregnant, or within 6 months post-partum. Through utilizing the PCE Risk Estimator, estimated 10-year ASCVD risk score and lifetime ASCVD risk percentage, if appropriate, were calculated and documented in a note entered in the electronic health record. Patient-specific data elements used to calculate the risk score were also listed in each note. Final recommendations were made to identify the most appropriate statin benefit group for each patient. Recommendations made included initiating statin therapy, changing statin dose intensity, obtaining additional lab work, and suggestion for referral to the clinical pharmacist (CP) for modifiable risk factor management. Recommendations were approved by the supervising CP before provider review, and notes were then forwarded to the provider prior to the patient visit.

Data extracted from the risk review notes were analyzed, and chart review of the subsequent two patient appointment provider progress notes (over 6 months) were examined to determine

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
whether a provider accepted, declined, or acknowledged the Risk Review note prepared. When numerous recommendations were made for a single patient, each was evaluated separately.

**Results:** Risk Review notes were reviewed for 434 patients, showing 171 recommended statin drug changes. Patients not on a statin (N equals 277) contributed to 89 of the drug change recommendations, followed by 69 drug change recommendations for patients currently on a moderate intensity statin (N equals 113), and 10 drug change recommendations for patients on a low intensity statin (N equals 12). Statin treatment was subsequently initiated by providers for 21 patients not currently on a statin (23.6 percent acceptance). The 69 moderate intensity patient recommendations resulted in 23 drug changes (33.3 percent acceptance), and the 10 low intensity patient recommendations resulted in 2 drug changes (20 percent acceptance). Statin use was deemed appropriate upon baseline risk review in 16.7 percent of patients with clinical ASCVD (N equals 36).

A total of 342 patients received recommendations for either drug change/addition, obtaining lab work, or a referral to the CP for modifiable risk management. Of these, 135 recommendations (39.5 percent) were acknowledged by the provider as evident by at least partial execution of each recommendation. Recommendations for additional lab work (N equals 187) demonstrated a 46.0 percent acceptance rate, while CP referrals (N equals 171) demonstrated a 9.4 percent acceptance rate.

**Conclusion:** A single-site cardiovascular risk review service has been successfully implemented utilizing available clinical pharmacy resources. Provider statin prescribing habits were not in accordance with current guidelines, which unveiled an opportunity for pharmacist intervention. Further research is needed to enhance the current risk review process to improve statin prescribing habits, and provider acceptance rates. The current note documentation process does not require a definitive response from providers making it easily overlooked. An active recommendation program requiring review and response to every note should be explored and evaluated for effectiveness.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Ambulatory Care

**Session-Board Number:** 7-018

**Poster Title:** Impact of pharmacist interventions in a county family medicine clinic and associated cost avoidance

**Primary Author:** Yvonne Mai, Thomas J. Long School of Pharmacy and Health Sciences; **Email:** ymai@pacific.edu

**Additional Author(s):**
Jered Arquiette
La Donna Porter

**Purpose:** Medication related problems (MRPs) have long been recognized as a source of adverse drug reactions, hospitalizations, and increased morbidity and mortality. Many MRPs stem from polypharmacy and the lack of effective communication between healthcare providers. Elderly patients and those from traditionally underserved communities tend to be at higher risk of MRPs and they often incur significant healthcare costs as a result. Clinically trained pharmacists are often an underused resource in the primary care setting. The purpose of this study was to evaluate pharmacist interventions and the associated cost avoidance in a county hospital family medicine clinic.

**Methods:** The study consisted of two phases: retrospective chart review and prospective intervention phase. For the retrospective review a list of all patients aged 65 or older that visited the family medicine clinic in 2015 was generated and 100 patients (50 males and 50 females) were randomly selected for review. A pharmacist reviewed the patient’s most recent visit notes to collect demographic information and identify potential MRPs. The prospective phase consisted of a 12 week period between January and April 2016. During this time period a pharmacist worked directly in the family medicine clinic conducting medication reconciliation, consultations, and profile reviews. If any MRPs were discovered the pharmacist would communicate with the patient’s physician in an attempt to resolve the problem. Primary outcomes included the number and type of pharmacist interventions and the estimated cost avoidance to the health system. Two pharmacists evaluated the interventions for their potential to prevent additional office visits or emergency room visits. A primary care physician served as the final reviewer for the pharmacist interventions and had the ability to change or remove any interventions they did not believe would prevent additional visits. The physician reviewed list was then used to estimate the cost avoidance to the institution. Evaluative

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
statistics, including the Chi-square test and the Mann-Whitney U test, were used to identify if sociodemographic characteristics were associated with particular MRPs.

**Results:** A total of 132 patients were included in the retrospective review period and there were 149 potential MRPs identified. During the prospective period the pharmacist worked in the family medicine clinic approximately nine hours per week (approximately 0.225 full time equivalents) and encountered a total of 100 patients. Sixty three patients had at least one MRP (63 percent). Eighty three MRPs were identified and resulted in 89 pharmacist interventions. Opportunity for therapeutic optimization was the most frequently identified MRP (56 percent) and patients identified as non-Caucasian were more likely to experience this MRP (p less than 0.05). The next most commonly encountered MRPs were therapeutic duplications and inappropriate medications, each occurring at a rate of 11 percent. The most frequent pharmacist interventions were patient education (28 percent) and therapeutic interchange (20 percent). During the 12 week study period pharmacist interventions were estimated to prevent 37 additional office visits and 26 emergency room visits, leading to an estimated cost avoidance of 8,115.20 dollars.

**Conclusion:** A pharmacist working in a primary care clinic can identify and help resolve MRPs, especially in areas with traditionally underserved populations. Pharmacist services can potentially reduce health care costs by helping avoid unnecessary office visits and emergency room visits related to MRPs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-019

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

Primary Author: Natohya Mallory, UF Health Jacksonville; Email: natohya.mallory@jax.ufl.edu

Additional Author (s):
Shameik Brooks
Karen Malcolm
Linda Edwards

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

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

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

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

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-020

Poster Title: Identification of learning needs in health care professionals who prescribe or provide advice to patients receiving inhaler treatment

Primary Author: Abdulmohsin Marghalani, Security Forces Hospital Makkah; Email: pharmalani@gmail.com

Purpose: COPD and asthma sufferers uses inhaler for treatment and for controlling their symptoms. Healthcare professionals are often experts in educating patients about the various different inhalers available and in prescribing the one most suitable for their particular patient. A number of studies have identified various learning needs, namely, the inability to prescribe the right medication or demonstrating the correct inhalation technique delivery as well as not following the local guidelines in Lothian, Scotland. In addition, patients have difficulties as a result of not being receiving adequate instructions and or being properly shown how to make efficient use of their inhalers.

Methods: Lothian health care professionals were involved in the completion of an online survey on inhaler use, focusing on patient education and on clinical decision-making. The design was a descriptive cross-sectional questionnaire. Questions were specific and dependent on the involvement of HCPs with patients. The findings were reported using Scotland current guidelines and after consulting the relevant literatures.

Results: Seventy-four HCPs responded to all the questions. Common side-effects of salbutamol, tiotropium and steroid inhalers were incorrectly selected by 75.0%, 47.7% and 72.0% of HCPs respectively. The intervention of influenza/pneumococcal vaccination in COPD was not advised by 96.4% of HCPs whereas smoking cessation was recommended by 64.3%. The inability to match appropriate advice with the correct inhaler was observed in 64.3%. MDIs and accuhalers were incorrectly matched with the advice given by 68.9%. Almost half of the HCPs identified the correct elements in the Lothian self-management plan.

Conclusion: The results were consistent with other studies that showed a poor knowledge of inhalers amongst HCPs. Designing focused educational sessions can all lead to substantial improvements and to better care for patients. Enhanced education and training for HCPs will inevitably lead to better prescribing and educating for all patients using inhalers.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Ambulatory Care

**Session-Board Number:** 7-021

**Poster Title:** Factors that increase medication adherence and quality of life in heart failure patients in Lebanon

**Primary Author:** Mariam Marmar, Lebanese International University; **Email:** mariam-marmar@live.com

**Additional Author (s):**
Sara El Mokdad
Fouad Sakr
Mariam Dabbous
Jihan Safwan Saade

**Purpose:** Heart failure affects more than 20% of Americans aged 40 years and above. Recently, medication adherence and health-related quality of life have been the focus of medical research in the field of chronic diseases, due to their correlation with disease prognosis. Data in Lebanon and the Middle East reports very few articles regarding medication adherence and quality of life. Therefore, we conducted this study to evaluate the factors related to better medication adherence and its effect on quality of life in heart failure patients in the Lebanese community.

**Methods:** The Institutional Review Board of the Lebanese International University approved this study. Data collection was done in several community pharmacy sites and cardiologists’ clinics in different regions of the country by the authors between January 2015 and June 2016. The study included male and female patients aged 18 years and above with a definite heart failure diagnosis. The study excluded hospitalized patients who had a diagnosis of decompensated heart failure. The researchers obtained a written informed consent before interviewing the participants to fill the questionnaire. They collected data about the subjects' medication adherence and quality of life along with the calculation of the corresponding scores from validated surveys including Morisky Medication Adherence Score - (R) (MMAS-4) and Minnesota Living With Heart Failure - (R) Quality of Life questionnaire. All statistical analysis was performed using SPSS version 23.0 and presented as frequency, percentage, means, and standard deviations. A Pearson chi square p-value of less than 0.05 was considered to indicate statistical significance and binary logistic regression identified factors that increased medication adherence.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** The study included 202 patients of whom 55% were males, 38.6% were illiterate, 41.6% had an average economic status, and 73.8% were smokers. The analysis of the MMAS-4 scores identified multiple factors that could better medication adherence and eventually result in less hospitalizations. Those included the following: regularly purchasing medication (p-value < 0.001, Odd’s Ratio (OR) = 12.839), low therapy cost (p-value=0.005, OR= 0.246), using a pillbox and/or having a caregiver responsible for administering medication (p-value=0.003, OR= 5.707 in both cases), pharmacist counseling (p-value=0.026, OR =3.111), and regular clinic visits (p-value < 0.001, OR=7.500). Also, a positive relationship between health-related quality of life and medication adherence was established such as the improvement of adherence yielded a better quality of life scoring (p-value=0.02, OR=7.066).

**Conclusion:** Adherence to medications has been a crucial issue in the control of heart failure status and the enhancement of the health related quality of life and functional capacity of those patients. This study has shown that improving medication adherence has led to a better quality of life in the Lebanese population. Many trials are further needed in order to generalize the results obtained. A larger sample size on a bigger scale is required in future trials in order to allow for extrapolation of the results to the Middle East and North Africa region.
Submission Category: Ambulatory Care

Session-Board Number: 7-022

Poster Title: Evaluation of sustained virologic response rates after sofosbuvir/velpatasvir treatment in a diverse patient population at an urban academic medical center

Primary Author: Michelle Martin, University of Illinois Hospital and Health Sciences System / University of Illinois at Chicago College of Pharmacy; Email: mmichell@uic.edu

Additional Author(s):
Grace Go
Darby Rosenfeld
Todd Lee

Purpose: The pangenotypic direct-acting antiviral combination of sofosbuvir/velpatasvir offers high sustained virologic response (SVR) rates for hepatitis C virus (HCV) treatment. Real-world data on SVR rates in sofosbuvir/velpatasvir treatment is lacking. The purpose of this study is to evaluate the effectiveness of sofosbuvir/velpatasvir treatment at an urban academic medical center.

Methods: This retrospective chart review was approved by the institutional review board. Data were collected from the electronic medical records of patients who started HCV treatment with sofosbuvir/velpatasvir from June 28, 2016 to December 1, 2016. The investigators collected baseline characteristics including age, gender, ethnicity, body mass index (BMI), stage of liver disease stage, concurrent medications, comorbidities; previous HCV treatment history; current HCV regimen; lab results pertaining to disease progression and medication use; adjustments to HCV treatment, adverse events, and adherence. The data were analyzed using descriptive statistics, Fisher’s exact test, and Pearson’s chi-square test. The primary endpoint was the percent of patients who achieved SVR. Secondary endpoints included evaluation of SVR rates by baseline patient characteristics.

Results: Of the 22 patients who started HCV treatment with sofosbuvir/velpatasvir, SVR data were available for 14. They were 79 percent male, 21 percent African American, had a mean age of 57.7 years, and baseline BMI of 28.4. Fifty percent had genotype (GT) 2, 43 percent had GT 3, and 7 percent had GT 1. Seventy-nine percent were treatment naive, 50 percent were cirrhotic, 14 percent had diabetes, and 29 percent had psychiatric disease.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Seventy-one percent received sofosbuvir/velpatasvir and 29 percent received sofosbuvir/velpatasvir plus ribavirin. Few adverse events were reported; one of the 4 patients taking ribavirin experienced anemia which resulted in an interruption in ribavirin therapy. SVR was achieved in 100 percent of the 14 patients. The SVR rates did not differ by genotype, regimen, cirrhosis, treatment history, ethnicity, gender, age, BMI, diabetes, or psychiatric history. The SVR rates also did not differ by adherence; 1 patient reported missing 15-19 doses of HCV medication during treatment.

**Conclusion:** Despite a high proportion of cirrhotic patients, all patients treated with sofosbuvir/velpatasvir achieved SVR in this diverse patient population. The SVR rates did not differ by treatment history or demographics due to the 100 percent cure rate, and conclusions across groups are limited due to the small numbers. DAA regimens were well tolerated except for anemia in one patient receiving ribavirin.
Submission Category: Ambulatory Care

Session-Board Number: 7-023

Poster Title: Evaluation of the impact of a pharmacy transitions of care program (PTOC) on 30-day readmission rates in a large health-system

Primary Author: Daryl Miller, BayCare Health System; Email: daryl.miller@baycare.org

Additional Author(s):
Tim L'Hommedieu

Purpose: Thirty day hospital readmission rates have become a focus for health systems across the country in recent years, with about a fifth being attributable to medication related problems. Pharmacist involvement in the transitional care process has been studied but a consistent practice model is not yet established. BayCare Health System developed a pharmacist facilitated transitions of care pharmacy program and scaled it across eleven hospitals. The purpose of this study was to evaluate the impact of this pharmacy transitions of care program on reduction of 30-day readmission rates.

Methods: This was a retrospective, observational study performed from September 2016 to March 2017. The PTOC program consists of 2 patient encounters after discharge: a telephonic encounter within 7 days of discharge and a second encounter 21 days after discharge. During these encounters, pharmacists evaluated patient clinical status, reviewed medications, provided counseling, and intervened on any problems or opportunities identified during the encounter. Patients were included who were Medicare beneficiaries, age 65 years or older, discharged to home or assisted living facility, and with a primary diagnosis of a core measure disease state (chronic obstructive pulmonary disease, heart failure, acute myocardial infarction, coronary artery bypass grafting, pneumonia, knee or hip replacement, or stroke). Patients were excluded who were discharged to a skilled nursing facility, enrolled in Hospice, or on chemotherapy. The primary outcome measure is 30-day all-cause readmission rates. The secondary outcomes include number of provider contacts, care coordination contacts, pharmacy contacts, medication assistance program enrollments, disease state counseling, and medication counseling interventions performed by the pharmacist during follow-up. Patients were included in analysis who completed at least 1 follow-up call with a pharmacist. The primary outcome is compared to a parallel group of patients who did not receive PTOC services using a Chi-Squared test for analysis. The secondary outcomes are expressed numerically by category.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: During the study period, 2,286 patients were enrolled and analyzed. The comparison group comprised of 1,335 patients. The readmission rate for the study group was 8.3 percent (N equals 190), compared to 23.7 percent in the comparison group (N equals 317), which is a statistically significant difference (p less than 0.001). Pharmacists documented a total of 13,855 interventions including 1,503 contacts to members of the interdisciplinary team, 175 patients identified for medication assistance programs enrollment, and 12,177 counseling opportunities.

Conclusion: Patients who were enrolled in a pharmacist run transitions of care program experienced a lower 30-day all-cause readmission rate compared to those who were not enrolled.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Ambulatory Care

Session-Board Number: 7-024

Poster Title: Eight versus 12 weeks of ledipasvir/sofosbuvir in chronic hepatitis C (HCV) genotype 1 patients

Primary Author: Khoa Nguyen, Kaiser Permanente; Email: khoa.x.nguyen@kp.org

Additional Author (s):
Justina Ho
Robert Rathbun

Purpose: Ledipasvir/sofosbuvir (LDV/SOF) was the first fixed-dose combination DAA approved for the treatment of chronic HCV, genotype (GT) 1 infection. Clinical trials have demonstrated that sustained virologic response at 12 weeks (SVR12) after treatment with an 8-week regimen of LDV/SOF was non-inferior to 12-week regimen in certain patient populations. This study aims to evaluate the real-world effectiveness of 8 versus 12-week regimens using LDV/SOF for chronic HCV GT-1 patients in a HCV pharmacist-led clinic, and assess the influence of various baseline factors on SVR12 rates in a large integrated healthcare system.

Methods: This was a retrospective analysis of chronic HCV GT-1 patients that received 8 or 12 weeks of LDV/SOF within the San Diego and Fontana Kaiser Permanente service areas from November 1, 2014 to July 31, 2016. Effectiveness was determined by SVR12 lab results within each service area. Patients were excluded if they received solid organ transplant, received treatment courses other than 8 or 12 weeks, and/or received ribavirin as part of the regimen. Patients’ baseline demographics and clinical characteristics such as gender, age, AST-platelet ratio index (APRI) score, body mass index (BMI), and viral load, were also collected and analyzed to characterize the factors associated with treatment outcomes.

Results: A total of 810 patients with chronic HCV GT-1 were included in the study. SVR12 for 8 and 12-week courses were 95 and 97%, respectively. When looking specifically at the treatment naïve, non-cirrhotic cohort, the SVR12 for the 8-week course remained at 95%, whereas the SVR12 for the 12-week course was 99%. Factors that influence SVR12 were gender (females vs. males) (odds ratio [OR], 3.40; 95% confidence interval [CI], 1.33 to 9.09, P=0.011), APRI score (OR, 1.23; 95% CI, 1.12 to 1.37, P < 0.001 for every 0.5 APRI reduction), BMI (OR, 1.53, 95% CI, 1.11 to 2.13, P=0.011 for every 5 BMI reduction), HCV log (OR, 3.33, 95% CI, 1.37 to 7.69, P=0.008 for every 1 HCV log reduction).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Conclusion:** SVR12 rates in 8-week course of LDV/SOF were comparable to that of 12-week in this real-world study. Results further demonstrate the importance of pharmacist involvement in a multidisciplinary team to expand the usage of 8-week regimen for eligible patients.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Ambulatory Care

Session-Board Number: 7-025

Poster Title: Smart connected insulin pens and caps: a digitalized approach to diabetes management

Primary Author: Dhiren Patel, MCPHS University; Email: dhiren.patel1@mcphs.edu

Additional Author(s):
Shivani Shah

Purpose: Current insulin pens have improved diabetes care in regards to increasing patient adherence. However, these pens do not address issues such as unreliable documentation of therapy and delayed patient care. With innovative health technologies emerging, smart connected insulin pens and caps can enhance existing modalities of care. This poster will gather and compare information on the known commercialized devices with the goal of communicating promising new advances in diabetes care and determining the prospective role of these devices in practice.

Methods: A total of five source categories were used to gather information on smart connected insulin devices, and include: proprietary information, press release statements, case studies, periodic publications, and current news. Proprietary information was the primary source of data. However, all of the resources were utilized to determine the products that constitute the current landscape of smart connected devices, gather information on product design and function, or both. Additional evidence regarding product availability was retrieved from the FDA 510(k) database.

Results: Search results revealed information about seven commercialized smart connected insulin pens and three commercialized smart connected insulin caps. Of these, the only FDA approved devices include InPen, a Bluetooth-enabled insulin smart pen, and Timesulin, a timer-enabled cap for insulin pens. However, other devices are seeking US market approval and expect FDA clearance in the near future. Smart connected insulin pens function by automatically recording and transmitting insulin dosing data to a device. Data can be transmitted via one of three ways: Bluetooth, short-range radio interface, or by USB. Documented data can then be accessed in real-time by physicians, caregivers, or both. Additionally, the majority of these pens can accommodate all U-100 insulins in 3 mL cartridges. Smart connected insulin caps function by either displaying the time since the patient’s last dose
or by logging and transferring data to a device, similar to the previously discussed smart pens. However, compared to smart pens, these devices are smaller and more convenient in regards to transport. Most of these smart caps are also compatible with most major insulin pen brands. Individual product specific design further distinguishes these smart pens and caps from one another.

**Conclusion:** Smart connected insulin pens and caps offer a promising solution for diabetes management. Through an interactive platform, these devices simplify communication between the patient and clinician. This allows for real-time therapeutic interventions, reliable self-management of diabetes, and reduced disease-state complications. Although this pioneering technology has apparent benefits, limitations do exist. Further investigation of HIPAA compliance, health insurance reimbursement, and user accessibility is paramount to launching this idea to its full potential.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Ambulatory Care

Session-Board Number: 7-026

Poster Title: Bringing communities together: an interprofessional program to combat addiction

Primary Author: Haley Phillippe, Auburn University; Email: mccrahl@auburn.edu

Additional Author(s):
Brent Fox
Karen Marlowe
Lindsey Hohmann
Sarah Hill

Purpose: To review the impact of an interprofessional education program focused on advancing attendees’ abilities to combat prescription and illicit drug misuse and addiction in Alabama, through improved understanding of the problem, enhanced use of existing tools and resources for community involvement, greater appreciation of others’ roles in combating the problem, and focused multidisciplinary communication about the problem.

Methods: Healthcare providers, counselors, educators, first responders, law enforcement, regulatory boards, and community stakeholders were invited to participate in the program. Programs were offered in northern and central Alabama, with identical content provided on two consecutive days per region to allow maximum attendance. Program content was tailored to each region’s primary concerns related to drugs of misuse and abuse. All attendees were invited to complete pre and post surveys assessing their knowledge of the drug addiction and misuse problem in Alabama, the effectiveness of the conference’s educational programming, and their perspectives on drug misuse and addiction.

Results: 838 people attended the program and 635 completed the surveys. Survey results demonstrate that prior to the program most attendees underestimated the occurrence and severity of drug addiction and misuse in Alabama. Post survey results reveal statistically significant increases in knowledge and understanding of the drug crisis in Alabama and greater interest in collaborating with those in other disciplines and communities. Brainstorming activities lead to discussion and potential development of community programs focused on drug addiction. After completion of the program, attendees stated they feel more comfortable reaching out to other professions for advice and help regarding drugs of misuse and abuse.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Conclusion: Alabama has the highest rate of opioid prescribing in the US (143 prescriptions per 100 people per year), and drug overdose deaths have increased 20% over two years. By encouraging education and communication among community stakeholders, communities can become better prepared for developing programs to combat drug addiction and misuse. Programs focused on interprofessional communication open new avenues for these community programs as well as foster lasting relationships between different professions.
Submission Category: Ambulatory Care

Session-Board Number: 7-027

Poster Title: Communication satisfaction and Preferences among Hispanic outpatients: a systematic review

Primary Author: Nooria Razai, Virginia Commonwealth University; Email: razain@vcu.edu

Additional Author(s):
Kristin Zimmerman

Purpose: Satisfaction with provider communication is associated with health service utilization, quality of care delivery, and medical outcomes. However, satisfaction may be limited when language and culture are discordant. Hispanics account for the nation’s largest ethnic minority. Non-English speaking Hispanic patients have been shown to have decreased satisfaction with healthcare quality which may ultimately impact healthcare outcomes. As complete concordance for all patients is not always feasible, the purpose of this study is to assess critical factors impacting patient satisfaction with healthcare, provider interpersonal skills, or provider verbal communication as well as patient-perceived quality of communication and preference for communication method.

Methods: A systematic search of Pubmed was conducted from inception to July 2016 for studies of Hispanic patient communication in healthcare. Studies of Spanish-speaking, Hispanic patients, that assessed verbal communication with healthcare providers in outpatient settings and its association with patient preference and/or satisfaction with either provider or overall communication were included. Studies that only assessed care preferences or satisfaction with overall healthcare, or specifically assessed the impact of translators or interpreters were excluded. Extracted data included site characteristics, patient and provider demographics, communication interventions, satisfaction with healthcare, provider interpersonal and verbal, communication skills, patient perceived quality of communication, and patient preference for communication method. Data were analyzed qualitatively.

Results: The initial search returned 201 studies which were then assessed independently by reviewers for inclusion. After exclusion by title, abstract, and full-text review 11 studies remained. Factors impacting the outcomes of interest were divided into patient, provider, and shared categories. Patient factors (7 studies), included native language (5 studies), ethnicity (1 study), and acculturation (1 study); provider factors (5 studies) included cultural competency (2...
studies) and provider language (5 studies); and shared factors included concordance (1 study) in language, culture, race or gender. The impact of patient native language on satisfaction with healthcare was mixed (4 studies); however, Spanish-speakers were less satisfied with provider interpersonal skills (1 study) and verbal communication (2 of 3 studies). Patient ethnicity did not impact satisfaction with healthcare (1 study). Provider cultural competency was linked to patient satisfaction with provider interpersonal skills (1 study) and with improved patient perceived quality of communication (2 studies). Shared language also enhanced satisfaction with verbal communication (4 studies). When comparing gender, race, ethnicity, and language concordance, Spanish-speakers reported more ethnic but less language concordance compared to English-speaking counterparts. However, these concordance variables did not explain differences in satisfaction between English and Spanish-speakers (1 study).

Conclusion: This review found that patient acculturation, provider cultural competency and provider concordance to patient language are important features of patient satisfaction. Improving patient acculturation through language skills-development in the home and in practice, as well as increasing time spent in the U.S. may improve satisfaction measures, but may be impractical for clinicians to impact. Training future practitioners to become linguistically and culturally competent as the population shifts may enhance patient satisfaction, the patient-provider relationship, and ultimately patient outcomes.
Submission Category: Ambulatory Care

Session-Board Number: 7-028

Poster Title: Weight gain associated with insulin detemir versus insulin glargine in clinical practice: a retrospective longitudinal cohort design

Primary Author: Thomas Wadsworth, Idaho State University College of Pharmacy; Email: wadsthom@isu.edu

Additional Author(s):
Karl Madaras-Kelly
Richard Remington
Glenda Carr
Brian Bell

Purpose: Insulin associated weight gain is a challenging problem, particularly in the treatment of overweight patients with diabetes mellitus, type 2. Insulin detemir has consistently demonstrated less weight gain in comparative randomized studies against the industry standard, insulin glargine. However, the magnitude of detemir’s reduction in weight gain (0.77 to 1.37 kg) may not be completely generalizable to patients in real-world practice conditions beyond the constraints of controlled studies. The purpose of this study is to substantiate detemir’s purported weight sparing effects in newly treated patients with diabetes type 2, but under the conditions and constraints found in real-world practice settings.

Methods: A retrospective longitudinal cohort design was applied to an existing data set of electronic health records to identify insulin naive, overweight, DMII patients. Records were excluded if subjects had unstable or undetermined baseline weight measurements, previous exposure to any insulin, BMI less than 25, concurrent use of loop diuretics or co-morbidities causing variable/frequent weight change due to water retention (CHF, peripheral edema, ascites). Subjects meeting inclusion/exclusion criteria were randomly selected in an unmatched 1 to 1 fashion for full electronic chart review and abstraction to collect baseline weight, post-exposure weight, and other covariates of interest. The primary outcome was the greatest weight change occurring after a patient's exposure to detemir or glargine within one year of continued exposure. Change in body weight was determined by subtracting the patient's baseline weight from the highest recorded post-exposure weight within one year of continued exposure. The difference in mean change in total body weight between detemir and glargine cohorts was tested by the analysis of covariance (ANCOVA). An estimated sample size of 215
patients per group was required for 80% power to detect a 1.0 kg difference in mean weight change between detemir and glargine groups within 1 year of continued exposure. Secondary measures collected during abstraction included demographics, pre- and post-exposure A1c, concurrent co-morbidities, concurrent medications, and beginning and final dose of insulin.

**Results:** 2,531 potential patient records were identified (1593 glargine users and 938 detemir users) within the electronic medical record data set. 109 patient records (56 glargine users and 53 detemir users) met the inclusion criteria and underwent full abstraction. There was no statistical difference between the insulin groups in age, gender, baseline weight, baseline A1c, initial insulin dose, concurrent metformin use, concurrent sulfonylurea use, or any concurrent weight gaining/sparing medication. The detemir group contained a significantly larger percentage of Hispanic patients (51 vs 36 percent) than the glargine group. The crude estimate of mean change in body weight associated with detemir relative to glargine use was negative 0.64 kg (p equals 0.45) in favor of detemir. The ANCOVA model for change in body weight consisted of baseline body weight, mean insulin dose per kg of baseline body weight, days between baseline and final body weight measurements, and concurrent sulfonylurea use. The covariate-adjusted estimate of mean change in body weight associated with detemir relative to glargine use was negative 1.5 kg (p equals 0.04) in favor of detemir. The covariate-adjusted estimate of mean change in A1c associated with detemir relative to glargine use was negative 0.57 percent points (p equals 0.16).

**Conclusion:** Planned sample estimates for the primary outcome was not met. However, the observed effect size of the primary outcome was larger than the estimate in the sampling calculations resulting in adequate power to test the primary hypothesis. After covariate-adjustments, the mean weight savings associated with detemir use was significantly greater than glargine use and the magnitude was consistent with weight savings demonstrated in randomized controlled trials. These results further substantiate detemir’s purported weight saving properties in this patient population, even under conditions found in a real-world practice setting. The clinical significance of these findings is undetermined and requires further investigation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Ambulatory Care

**Session-Board Number:** 7-029

**Poster Title:** Comparing regimens of insulin glargine U-300 plus lispro U-100 or lispro U-200 in patients converted from U-100 basal insulins

**Primary Author:** Shari Williams, St. Luke's University Health Network; Email: s.n.will16@gmail.com

**Additional Author(s):**
Daniel Longyhore

**Purpose:** The purpose of the research is to evaluate glycemic control for patients switched from a traditional basal-bolus insulin regimen with standard-concentration insulin (U-100, 100 units/mL) to a regimen consisting of glargine U-300 (300 units glargine/mL) paired with either lispro U-100 (100 units/mL) or lispro U-200 (200 units/mL). Our hypothesis is that patients using glargine U-300 plus a concentrated-bolus insulin will have greater A1C lowering than those who remain on standard-concentration bolus insulin. Secondarily, we will investigate changes in the total daily dose of insulin, the required number of injections per day, and the likelihood of achieving A1C target.

**Methods:** Patients’ records were included in this study if the patient was prescribed a concentrated-insulin formulation for at least 6 months within an internal medicine or endocrinology practice. Patient demographics, insulin regimen, non-insulin agents, total daily insulin dose, number of daily injections, and A1C were recorded immediately prior to conversion to concentrated-insulin. Data was then collected on post-conversion insulin regimens, other insulin and non-insulin therapies, total daily dose, number of daily injections, A1C most recent to January 2017, and adverse event rates. Surrogate marker changes from pre-to post-conversion were evaluated as paired data. Comparisons in degree of surrogate marker changes between regimens were evaluated as independent data. The likelihood of reaching A1C targets and adverse events were considered a binary outcome and evaluated as such.

**Results:** Seventy-eight records were included in the analysis. All included patients were prescribed glargine U-300 as their basal agent; fifty-seven continued to use lispro U-100 and 21 were prescribed lispro U-200 as their bolus agent. A1C was significantly lower than baseline following transition to concentrated basal insulin with both lispro U-100 (-0.53%, p=0.032) or lispro U-200 (-1.23%, p=0.001), but the change was not significantly different between the two

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
groups (Δ 0.7%, p=0.120). In addition, neither total daily insulin dose changes (11.4 units vs. 38.3 units) nor number of daily injection changes (0.37 injections vs. 0.38 injections) after transition were significantly different between glargine U-300 paired with lispro U-100 or lispro U-200, respectively. Twenty-six (45.6%) of patients in the glargine U-300 plus lispro U-100 group achieved an A1C of less than 8% compared to nine (42.9%) of those using lispro U-200 as a bolus insulin (p=0.828). When the A1C target was set to 7%, the difference remained not significant with 22.8% (lispro U-100) and 14.3% (lispro U-200) of patients reaching target.

Finally, the adverse event rates were not significantly different between the two groups (10.5% vs. 31.3%, p=0.135).

**Conclusion:** When patients transition from a standard concentration basal-bolus insulin regimen to one with a concentrated basal insulin (glargine U-300), use of either lispro U-100 or lispro U-200 insulin for bolus doses does not significantly differ with regard to surrogate marker changes, achieving glycemic targets, or adverse event rates. The limited number of available records makes it difficult to identify a smaller effect size within the data and may explain the lack of difference in A1C changes between groups, despite the large absolute difference.
Submission Category: Ambulatory Care

Session-Board Number: 7-030

Poster Title: Diagnosis and treatment of latent tuberculosis (TB) and chronic hepatitis C (HCV) in a patient with advanced idiopathic cardiomyopathy undergoing heart transplant evaluation

Primary Author: Lisa Woolard, Kaiser Permanente; Email: lisa.m.woolard@kp.org

Additional Author(s):
Carla Knowles
Kathryn McDaniel

Purpose: The patient is a 60 year old African American male with no significant past medical history or chronic medications. He presented to Kaiser Permanente’s Advanced Care Center in September 2015 with dyspnea and chest pain that resulted in acute hospitalization. He was diagnosed with new idiopathic cardiomyopathy based on an ejection fraction (EF) of 15-20%. A left heart catheterization showed non-obstructive coronary artery disease and appropriate medication therapy was initiated. After three months, a repeat transthoracic echocardiogram showed no left ventricular recovery (EF < 20%). A right heart catheterization showed a cardiac index of 2.2% and evaluation for heart transplant referral was discussed, however the patient initially refused. In the next two months, he had multiple hospital admissions, was diagnosed with atrial fibrillation and started on warfarin therapy. He was subsequently discharged with an external cardiac defibrillator and placed on IV milrinone. He then consented to the transplant evaluation where both latent tuberculosis (TB) and hepatitis C (HCV) were discovered. The transplant team recommended completion of treatment for both infections prior to listing. The patient was referred to infectious disease and started on nine months of isoniazid therapy. Gastroenterology was consulted and further work up showed a Hgb of 9.9 g/dL, normal platelets, a normal hepatic panel, and HCV genotype 2. Imaging confirmed a non-cirrhotic liver. National HCV guidelines in May 2016 recommended the combination of sofosbuvir and ribavirin for twelve weeks, however ribavirin’s side effect profile includes hemolytic anemia. A non-ribavirin containing regimen for HCV genotype 2, sofosbuvir/velpastasvir (SOF/VEL) was slated for approval at the end of June 2016. Therefore, treatment was deferred for the new regimen since latent TB treatment was planned for 9 months and HCV treatment is only 12 weeks. However, the patient’s heart failure progressed rapidly and within 6 weeks he was re-hospitalized, started on amiodarone and in need of a left ventricular assist device (LVAD). The cardiothoracic surgeon required an undetectable HCV level prior to LVAD placement, so the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
patient initiated treatment with SOF/VEL with plans for discharge. The combination of SOF/VEL and amiodarone has a potential risk of symptomatic bradycardia, therefore his impending release was delayed, and he remained hospitalized to allow for appropriate monitoring. His HCV became undetectable within four days of initiating SOF/VEL therapy and the LVAD was placed two weeks later. Four weeks after starting HCV therapy, the patient was discharged. Hospital chart notes revealed four missed doses of SOF/VEL during hospitalization due to NPO status. Within days of his release, the patient’s anemia worsened (Hgb 6.9 g/dL) and he was re-admitted for LVAD-associated GI bleed. Over the next 6 weeks, the patient had multiple readmissions for GI bleeds and was eventually managed with IV octreotide and IV PPIs. The combination of PPI therapy and SOF/VEL is contraindicated due to the reduction of velpatasvir levels. Therefore, when the patient was switched to oral pantoprazole at discharge, he was instructed to separate administration of SOF/VEL and pantoprazole by four hours. He also began monthly subcutaneous octreotide injections while he completed therapy for HCV and latent TB. As of June 2017, he has completed treatment for latent TB and achieved a 24 week off treatment sustained virologic response for his HCV and is still in the process of heart transplant evaluation.
Submission Category: Ambulatory Care

Session-Board Number: 7-031

Poster Title: Study of public health activities in community pharmacies in enugu metropolis, Nigeria: prospects and challenges

Primary Author: Ogochukwu Offu, Enugu State University of Science and Technology; Email: offu.ogochukwu@esut.edu.ng

Purpose: The burgeoning gap between real Community Pharmacy practice and delivery of Public Health activities in Nigeria define the need for integral, participatory, and inclusive public health best management system in Nigeria. Consequently, the study planned Community pharmacy practice as one-stop health care integrated system that provide conscionable health services for the ailing public. It determined the knowledge, attitude and practice of Public Health by community pharmacists in Enugu; identified barriers and milestones that prevented community pharmacists from carrying out public health activities; identified interventions that mitigated the barriers and improved public health activities sufficiently and efficiently. This enhanced the overall health indices and economic ecology of community pharmacy practice in the state.

Methods: The project was divided into three strategic phases. The first phase was a cross sectional study to assess knowledge, attitude and practice (KAP) of public health in 40 community pharmacies through planned and targeted administration of questionnaire; while the second phase was a Delphi study comprising expert participants selected from 11 community pharmacies and the third design was the critical evaluation and assessment and/or analytic adequation of facts and results for inferential conclusion.

Results: The result of the first phase consisted of an average satisfactory knowledge and practice score of 31.9% and 39.4% respectively while the total attitude score was 54.0± 8.9. Consensus was reached on 81 out of 88 items suggested to be feasible and on 18 out of 20 suggested interventions. Overall, major findings of the research include inadequate funding (58%), lack of space (33%), lack of time (28%), cooperation of clients (23%), inadequate staff (15%), insufficient knowledge (13%), remuneration (8%) and government regulations (5%). It was also found out that the knowledge and practice of public health by community pharmacists in Enugu metropolis were non satisfactory although they had positive attitude towards practice of public health.
Conclusion: The study concluded that the overall health system gap between community pharmacy practice and delivery of public health activities in Enugu-Nigeria was grave and needed urgent public-private conscionable, collaborative, integrated and practicable intervention mechanisms to reduce the effects of identified barriers. The impact of very poor budgetary provision and general mismanagement of public funds exacerbated professional incompetence, extremely low job satisfaction and impeded the enactment and promulgation of appropriate legislation to provide and secure the capacity and capability of health personnel, health innovative research and planned development of health infrastructure to cope with the rising trend of health challenges.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-032

Poster Title: ABCB1 polymorphisms and warfarin treatment in patients with mechanical cardiac valve

Primary Author: Sook Hee An, Wonkwang University; Email: shan7@wku.ac.kr

Additional Author(s):
Byung Chul Chang
Kyung Eun Lee
Hye Sun Gwak

Purpose: There have been many pharmacogenetic studies on the genetic regulation of warfarin treatment, but few studies of drug transporter gene associated with warfarin have been conducted. This study aimed to evaluate the effect of ABCB1 polymorphisms on stable warfarin doses and bleeding complications at therapeutic international normalized ratio (INR) in Korean patients with mechanical cardiac valves.

Methods: One hundred eighty-seven patients with mechanical cardiac valves who were on warfarin anticoagulation therapy and maintained INR levels of 2.0 - 3.0 for 3 consecutive times were included in this retrospective study. Data including age, body weight, body mass index, gender, position of valve prosthesis, valve types, concurrent medication, comorbidity, INR measurements, daily warfarin doses, and history of bleeding complication were collected. ABCB1 rs1045642 and rs2032582 were genotyped. The influence of genotypes on warfarin doses and bleeding complications were evaluated.

Results: ABCB1 polymorphisms of rs1045642 and rs2032582 did not show a significant association with warfarin doses requirement. The stable warfarin daily dose of patient with CC, CT, and TT genotype in ABCB1 rs1045642 were 5.48 ± 1.97, 5.45 ± 1.77, and 5.38 ± 2.28 mg, respectively. The stable warfarin daily dose of patient with TT, GT, AT, GA, GG and AA genotype in ABCB1 rs2032582 were 5.21 ± 2.21, 5.49 ± 1.77, 5.20 ± 1.88, 5.69 ± 2.20, 5.36 ± 1.75 and 5.48 ± 1.23 mg, respectively. Patients with TT genotype in ABCB1 rs1045642 were more likely to experience a major bleeding event than patients with the CC or CT genotype (16.7% vs. 1.9%, p = 0.007). For ABCB1 rs2032582, the percentage of patient with major bleeding was significantly higher in the group of TT compared with the group of the other genotypes (14.8% vs. 1.9%, p = 0.009).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Conclusion: Our results suggest that ABCB1 rs1045642 and rs2032582 polymorphisms could be predictors of major bleeding complications of warfarin at normal INR. No association could be found between therapeutic doses of warfarin and these genetic markers. Additional studies similar to ours but in populations with genetic backgrounds should be required.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-033

Poster Title: Effect of modifiable and non-modifiable risk factors on blood pressure control in a sample of Lebanese population

Primary Author: Rawan Barakat, Ruby Pharm; Email: rawanebarakat@hotmail.com

Additional Author(s):
Fouad Sakr
Rana Jaafar
Mariam Dabbous
Mohamad Iskandarani

Purpose: Hypertension is one of the most important risk factors for cardiovascular diseases. Patients with multiple risk factors whether modifiable or non-modifiable have an increased risk of developing hypertension; hence the appropriate implementation of lifestyle modifications to achieve better blood pressure control is crucial. This study evaluates the effect of risk factors on blood pressure control in the Lebanese population, to identify which factors significantly affect it more than others and to encourage patients to implement therapeutic lifestyle changes along with pharmacological treatment.

Methods: This observational cross-sectional study was approved by the institutional review board. The study was conducted in rural and urban Lebanese community pharmacies, patients’ residences and doctors’ clinics. Patients with hypertension and receiving anti-hypertensive drugs were enrolled in the study. The JNC8 guideline was the reference used to identify patients who are controlled versus those who are not. The primary end point of the study was to evaluate the effect of gender, age, education, body mass index (BMI) and other related co-morbidities on blood pressure control. Chi-square and Fischer exact tests were used to compare qualitative variables while t-test was used for comparisons of quantitative variables. Multivariable analysis using logistic regression was carried out to analyze and compare the variation in blood pressure goal in relation to each variable in the analysis.

Results: 700 patients were enrolled in the study, including 369 males and 331 females with a mean age of 59 years for males and 61.3 years for females. Data showed that most patients were overweight with an average BMI of 28.24 kilograms per square meter for males, and 27.37 kilograms per square meter for females. Hypertension awareness was better in females,
patients with older age, co-morbidities, and those with a higher education level. The association of different independent variables with at goal blood pressure was investigated using appropriate bivariate and multivariable analysis. Variables that showed significant association with being at goal blood pressure included age (P less than 0.001), BMI (P equals 0.002), gender (P equals 0.005), and dyslipidemia (P equals 0.003).

**Conclusion:** Our findings highlight the effect of modifiable and non-modifiable risk factors on blood pressure control, taking into consideration that all patients were on anti-hypertensive drugs. It is important to stress that hypertension is multi-factorial, thus, therapeutic lifestyle changes are vital part of the hypertension management process. Therefore, Lebanese pharmacists should further educate their patients to implement lifestyle modifications along with the use of anti-hypertensive drugs to optimize their blood pressure control.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-034

Poster Title: Elevated international normalized ratio (INR) in patient treated with apixaban and amiodarone

Primary Author: Sarah Barlow, Community Medical Center; Email: sarah.barlow@rwjbh.org

Purpose: This case report illustrates the potential drug interaction between amiodarone and apixaban in a 68 year old Caucasian male patient. The patient presented to the emergency department (ED) with tachypnea and swollen legs during the previous two days. His past medical history is significant for atrial fibrillation, coronary artery disease, congestive heart failure (CHF), and coronary artery bypass graft (CABG). His home medications include amiodarone 200mg oral twice daily, apixaban 5mg oral twice daily, aspirin 81mg oral daily, cholecalciferol 2,000 international unit oral daily, furosemide 40mg oral daily, multivitamin oral daily, omega-3-polyunsaturated fatty acids 1,000mg oral daily, pantoprazole 40mg oral daily, potassium chloride 20mEq oral daily, and simvastatin 20mg oral at bedtime. Amiodarone had been recently added during a previous admission two weeks ago for syncope and ventricular tachycardia (VT). The patient was evaluated in the ED and admitted for CHF exacerbation. Upon presentation to the ED, the patient’s international normalized ratio (INR) was 5.62 and prothrombin time (PT) was 57.7. Phytonadione 10mg orally was ordered and administered prior to pharmacist intervention. Once the ED pharmacist became involved with the case, a patient history was performed. The pharmacist recommended a re-check of the INR and holding apixaban until INR decreased. The patient did not take any of his outpatient medications on the day of presentation to the ED, leading to the apixaban dose being inadvertently held on the day of admission. The patient received two doses of 5mg on day 2. After pharmacist intervention, the cardiologist then held apixaban for 24 hours, ordered a reduced dose for re-initiation of therapy, and re-evaluated based on liver function tests (LFTs) and INR. Repeat INR on day 3 was 4.06 and repeat PT was 42.1. On day 4, INR was 3.5 and PT was 36.4 and apixaban was restarted at 2.5mg oral twice daily. On day 5, INR was 4.61 and PT was 47.6 and apixaban was held. On days 6 through 8, INR and PT continued to decrease. LFTs and renal function were also monitored for any trends that could contribute to the ongoing INR elevation. On day 9, the patient expired. Initially, the patient was treated with phytonadione for his elevated INR and possible coagulopathy. Phytonadione does not reverse the effects of apixaban, a factor Xa inhibitor. Apixaban does not reliably and/or predictably affect INR, but according to the manufacturer, there is a concentration dependent effect on INR. Further review of the patient’s previous records showed that the INR was 1.92 prior to initiation on amiodarone therapy two
weeks ago. The patient had been on apixaban for two months prior to initiation of amiodarone. The package insert for apixaban recommends a dose reduction to 2.5mg oral twice daily for patients receiving concomitant therapy with strong dual CYP3A4 and P-gp inhibitors. Amiodarone is an inhibitor of P-gp and CYP3A4, but is not specifically named in the package insert. While apixaban and other direct oral anticoagulants (DOACs) are often viewed as easier to manage than warfarin due to the lack of monitoring requirements, this case illustrates that potential drug interactions need to be evaluated prior to initiation and during DOAC therapy and DOAC therapy still needs to be closely monitored.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-035

Poster Title: Pharmacist in heart failure programs optimizing pharmacological therapy to target doses and effects

Primary Author: Hanin Bogari, King Abdulaziz University; Email: hbagari@kau.edu.sa

Purpose: Pharmacist is an important member in heart failure programs to optimize therapeutic plans for heart failure patients. Many programs use written standard protocol to advance management of heart failure patients, other programs treat patients according to clinical experience. The aim of this study is to compare the impact of using written standard protocol versus individual clinical experience on adherence to clinical guidelines and the impact on patient care and clinical outcomes.

Methods: Two programs at the hospital were identified, first program; pharmacist using written standard protocol for heart failure management, second program; pharmacist using own clinical experience in heart failure management. Database for patients under the two programs was collected and followed for twelve months period. Data in this study include baseline characteristics (age, gender, ethnicity), etiology of heart failure (HF), comorbidities, and prescription of ACEIs, ARBs, BBs, and MRAs with doses. Evaluation of clinical outcomes in length of stay, hospital readmissions within 30 days of discharge, emergency visits, and death for patients on two programs is compared.

Results: Two hundred patient profiles were reviewed. One hundred patient in each study program. The results showed an average length of hospital stay of 3.5 days for the first program, and 5.5 days for the second program. Number of readmissions within 30 days of discharge was 15 (15%) for the first program and 22 patients (22%) for the second program. The number of emergency visits was 18 for the first program, and 25 visits for the second program. Number of patients died was 6 for the first program and 5 for the second program.

Conclusion: Pharmacist in heart failure program using written standard protocol had better compliance to heart failure guidelines and accordingly patients clinical outcomes were improved.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-036

Poster Title: Determination of the appropriateness of a heparin dosing weight cap in an anti-Xa based protocol

Primary Author: Jennifer Brandt, MedStar Washington Hospital Center; Email: jennifer.l.brandt@medstar.net

Additional Author(s):
Margaret Breakenridge

Purpose: Weight-based heparin nomograms have been in existence for more than 20 years. However, the nomograms and subsequent studies have not typically addressed obese patients. Additionally, these studies and nomograms are all based upon PTTs, which can be affected by obesity. The protocol in place at this large, tertiary care hospital is based upon the Raschke protocol. A weight cap of 85 kg was instituted in the mid-1990s based upon an internal regression analysis. As the hospital has switched from PTT to anti-Xa for monitoring, an evaluation was undertaken to determine if the 85 kg cap was still appropriate.

Methods: A list of patients receiving a heparin drip during a one month period was derived from the pharmacy order entry system. Information was collected on the indication, protocol, actual and dosing weights, anti-Xa levels, and episodes of bleeding or the development of clots. Patients were excluded if the protocol was not followed, if there was insufficient or missing data, or if heparin was not started or if it was discontinued prior to the first anti-Xa level.

Results: A total of 114 patients were evaluated. Thirty patients were excluded, with 84 included in the final evaluation. Two-thirds of patients were on the standard protocol, with 19% on the acute coronary syndrome protocol, and 12% on the low target range protocol. The number of patients both < 85 kg and -85 kg was equally split and similar across all protocols. Initial anti-Xa levels were equally divided between subtherapeutic, therapeutic, and supratherapeutic levels and did not differ based upon weight. For patients < 85 kg, the rates for subtherapeutic, therapeutic, and supratherapeutic initial levels were 27%, 27%, and 46% respectively. For -85 kg, the rates were 38%, 34%, and 28%. These similarities persisted for all protocols. Time to achieve goal levels also did not differ significantly. No significant complications were identified.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Conclusion:** As levels did not differ significantly between obese and non-obese patients, it can be concluded that the weight cap of 85 kg is appropriate for all protocols.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-037

Poster Title: Characterization of adverse drug events associated with direct oral anticoagulants (DOAC) in patients presenting to a community hospital currently on a DOAC

Primary Author: Tina Hipp, Carolinas Healthcare System NorthEast; Email: tina.hipp@carolinashealthcare.org

Additional Author (s):
Victoria Forrest
Becky Szymanski

Purpose: Describe common adverse events as well as identify potential risk factors associated with use of direct oral anticoagulant therapy in patients presenting to the hospital.

Methods: A retrospective review of electronic medical records of patients admitted to the hospital over a three-month period (June 1, 2016 through August 31, 2016) was performed for patients meeting inclusion criteria (at least 18 years old, received a dose of rivaroxaban, apixaban, dabigatran, or edoxaban immediately prior to or during admission). Patients were excluded if they received a different oral anticoagulant within the last 5 days of admission, or were pregnant or nursing. The primary outcome was the incidence of adverse drug events (ADE) including major bleed events, minor bleed events, and treatment failures associated with use of DOACs. Secondary outcomes include risk factors associated with DOAC ADE, switch in therapy due to ADE, incidence of concomitant interacting medication with DOAC, and incidence of non-FDA approved indication or dosage. The research was reviewed and approved by the institutional review board.

Results: Of 387 patients studied, 11.1 percent experienced an ADE with 3.1 percent therapeutic failures, 3.6 percent major bleeds, and 4.7 percent minor bleeds. Patients in the dabigatran (16 percent) and edoxaban (20 percent) group experienced more therapeutic failures. Major and minor bleeds occurred most often in the rivaroxaban group (4.8 percent and 6.2 percent, respectively). The most common type of major and minor bleed event was gastrointestinal (64.3 and 50 percent, respectively). 25.6 percent of patients experiencing an ADE were on concurrent aspirin 81mg. Furthermore, 23.3 percent of patients had CKD and 34.9 percent were in AKI when an ADE occurred including those with acute on chronic kidney dysfunction. Approximately 95.9 percent of patients were on DOACs for an FDA-approved indication, with
similar rates among groups except for edoxaban. Upon presentation to the hospital, rates of non-FDA approved DOAC dosage was 11.4 percent; however, all patients on dabigatran were on the appropriate dose. Moreover, 18.6 percent of patients with an ADE had over four risk factors with the majority of those patients being on rivaroxaban. In regards to body weight, 30.5 percent had a total body weight of more than 100 kilograms with 8.5 percent experiencing an ADE.

**Conclusion:** There may be a higher incidence of major and minor bleeding with rivaroxaban while dabigatran and edoxaban were more associated with therapeutic failures. If an ADE required a switch in anticoagulation therapy, most patients were switched to warfarin. Assessment of common risk factors should be done prior to initiation of an anticoagulant medication and periodically as patient condition changes. As this study included only patients admitted to the hospital, these results are not generalizable to include patients outside of the acute care facility.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-038

Poster Title: Comparison of safety and effectiveness of standard and low dose rivaroxaban in patients with atrial fibrillation

Primary Author: Yi-Cheng Lin, Taipei Medical University Hospital; Email: linyic3@gmail.com

Additional Author (s):
Shu-Chen Chien
Chih-Wei Chen
Chun-Yao Huang

Purpose: Rivaroxaban demonstrated its non-inferiority to warfarin in stroke prevention with similar major bleeding rate at a dose of 20 mg/day in a global study. Considering higher risk of bleeding in Asians, 15 mg/day of rivaroxaban was evaluated in Japanese patients, and showed similar results as the global study. Recently, low dose rivaroxaban (10 mg/day) has been widely used in Asia. However, such dose was only tested in patients with renal impairment in clinical trial. Therefore, we aim to compare the safety and efficacy outcomes of standard dose (15 mg/day) and low dose (10 mg/day) rivaroxaban in patients with atrial fibrillation.

Methods: This was an observational, single-center, retrospective matched cohort study. Patients who were 20 years old or older with a diagnosis of atrial fibrillation, and had used rivaroxaban continuously more than 3 days between March 1, 2013 and June 30, 2016 were included. Subjects were matched for age. For quantifying thromboembolic risk, we combined comorbidity information into the CHA2DS2-VASc score. To assess the risk of bleeding, we calculated the ORBIT score, which had better ability to predict major bleeding compared with other risk scores and was validated in the large randomized trial (ROCKET-AF). The primary outcome was major bleeding, which was defined as fatal bleeding, symptomatic bleeding in a critical area or organ, bleeding causing a fall in hemoglobin level of 2 g/dL or more, or bleeding leading to transfusion more than two units of packed red blood cells. The secondary outcomes were overall bleeding and the composite of stroke, systemic embolism, and myocardial infarction. Patients were followed until the first occurrence of study outcome, last drug exposure date, or the study end date (March 31, 2017), whichever came first. Incidence rates were calculated as number of events divided by person time. To determine the risk of outcomes in low dose users compared with standard dose users (reference), we used Cox regression for multivariate analysis. The study was approved by the institutional review board.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: A total of 278 patients were included in the analyses with equal sample size between two groups. The median treatment duration with rivaroxaban was 383 days. The overall mean age was 74.9 (SD 9.7). The overall mean CHA2DS2-VASc score was 4.6 (SD 1.8). The overall median ORBIT score was 2.0 (range 0-7). The rates of major bleeding per 100 patient-years were 4.66 and 7.07 in standard dose and low dose group, respectively. Low dose rivaroxaban carried similar risk of major bleeding compared with standard dose (hazard ratio [HR]: 1.27; 95% confidence interval [CI]: 0.44 to 3.66). For the rates of overall bleeding, no difference was found between two groups (hazard ratio [HR]: 0.97; 95% confidence interval [CI]: 0.59 to 1.60). The rate of thromboembolism per 100 patient-years was 1.31 in standard dose group. No thromboembolic events occurred in low dose group.

Conclusion: In real-world practice in Asians with atrial fibrillation, use of low dose rivaroxaban (10 mg/day) neither lower the risk of bleeding nor increase the risk of thromboembolism.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-039

Poster Title: Frequency and characterization of venous thromboembolism prophylaxis in the inpatient and outpatient continuum of care among at-risk hospitalized patients in the US

Primary Author: Melissa Lingohr-Smith, University of California, Irvine; Email: melissa.smith@novosyshealth.com

Additional Author(s):
W Richey Neuman
Melissa Lingohr-Smith
Brandy Menges
Jay Lin

Purpose: Patients hospitalized for acute medical illnesses have a substantial risk for venous thromboembolism (VTE). The purpose of this study was to determine the frequency of VTE prophylaxis among at-risk patients and VTE risk during hospitalization and in the outpatient continuum of care.

Methods: Acutely ill medical patients were identified from the MarketScan Commercial and Medicare databases from 1/1/2012 to 6/30/2015. Hospitalized patients with acute medical conditions of heart failure, respiratory diseases, ischemic stroke, cancer, infectious diseases, and rheumatic diseases were included in the study population. The first of such hospitalizations were defined as the index hospitalization. Patients were required to have 6 months of continuous insurance coverage prior to (baseline period) and after (follow-up period, 180 days) the index hospitalization. Patient demographics, clinical characteristics, and hospital characteristics were evaluated. The proportions of patients receiving inpatient and outpatient VTE prophylaxis were determined. The risk for VTE events after the index admission was determined using the Kaplan-Meier method.

Results: Of the population hospitalized for acute illnesses (n=17,895; mean age: 58.4 years; 40% ≥ 65 years old; 55.4% female). Most patients were hospitalized for infectious diseases (40.6%), followed by respiratory diseases (31.0%), cancer (10.7%), heart failure (10.4%), ischemic stroke (6.4%), and rheumatic diseases (0.9%). Hospitals were mostly urban (87.2%) and large (67.6% ≥ 300 beds). Average hospital length of stay was 5 days. During hospitalization, 38.2% (n=6,843) received VTE prophylaxis for an average duration of 5.6 days. Of those with

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
inpatient VTE prophylaxis, 76.7% received enoxaparin only; 15.2% warfarin only; 5.3% enoxaparin and warfarin; and approximately 2% a direct oral anticoagulant (DOAC) only. Following hospital discharge to the outpatient setting, 9.7% (n=1,738) of patients received VTE prophylaxis (mean duration: 118.4 days); most received warfarin only (43.8%); 13.7% received a DOAC only; 10.1% enoxaparin only; 7.6% enoxaparin and warfarin; and 24.8% other types of prophylaxis. Among the entire study population, 59.1% (n=10,581) of patients did not receive any VTE prophylaxis, and only 7.1% (n=1,267) received both inpatient and outpatient VTE prophylaxis. During the follow-up period, 3.4% (n=613) of patients had a VTE event. VTE event risk in the inpatient/outpatient continuum of care remained prominent for up to 30-40 days after hospital admission.

**Conclusion:** Among this study population of hospitalized acutely ill medical patients, the risk for VTE was present in both the inpatient and outpatient settings, with significant VTE risk extending into the post-hospitalization period. However, only a small portion of at-risk patients (7.1%) received VTE prophylaxis in both the inpatient and outpatient continuum of care, suggesting an unmet medical need for VTE prophylaxis in the post-hospitalization patient population.
**Submission Category:** Cardiology / Anticoagulation

**Session-Board Number:** 7-040

**Poster Title:** Comparison of heparin infusion rates needed to obtain a therapeutic activated partial thromboplastin time in patients categorized into three different body mass index classifications

**Primary Author:** Ryan Morgan, Morton Plant Hospital Association, Inc.; **Email:** ryan.t.morgan@gmail.com

**Additional Author(s):**
Christine Price  
Jaclyn Yodice  
Lawrence Davila

**Purpose:** Venous thromboembolic events (VTE) pose life threatening complications to patients, especially if adequate anticoagulation is not initiated within the first 24 hours of diagnosis. Unfractionated heparin is recommended for the initial treatment of VTE. A challenge with heparin is its high variability in patient response contributed to characteristics such as weight. Studies and guidelines support dosing heparin based on actual body weight but data is limited on patients that are overweight or obese. This study will determine the initial heparin infusion rate needed to achieve therapeutic anticoagulation in VTE patients categorized into three different body mass index (BMI) categories.

**Methods:** The institutional review board approved this retrospective cohort study performed at a 650 bed community hospital. A total of 75 adult patients diagnosed with a VTE between July 2015 and April 2017 were enrolled. Patients received heparin through a hospital approved protocol which consisted of a 60 units/kg loading dose (maximum 8,500 units) followed by 15 units/kg/hour initial maintenance dose (maximum 2,000 units/hour). Infusion rate changes were made according to activated partial thromboplastin times (aPTT) and an algorithm that titrated to therapeutic ranges. Three different BMI groups determined by the World Health Organization’s BMI categories were studied. Group 1 had a BMI 18.5 to 29, Group 2 had a BMI 30 to 39 and Group 3 was a BMI 40 or more. The primary endpoint evaluated the mean heparin infusion rates required to achieve a therapeutic aPTT. Secondary endpoints included time needed to reach therapeutic aPTT ranges, percentage of patients with therapeutic levels at 24 hours, percentage of patients below or above therapeutic levels at 6 and 24 hours, adverse events and length of stay. It was determined that 23 patients per treatment group
would yield 80 percent power to detect a difference of 3.1 units/kg/hour for the primary endpoint. Statistical analysis performed were Pearson Chi-Square test or Fisher's Exact test (nominal data), One-Way ANOVA (continuous data) and Kruskal-Wallis test (non-parametric data).

**Results:** There was a significant difference in the primary endpoint of average infusion required to reach therapeutic aPTT levels (p equals 0.006). It was found that the non-obese group 1 required approximately 16.2 units/kg/hour and both obese groups 2 and 3 required 12.9 and 13.2 units/kg/hour respectively. As BMI increased, the average infusion that was required to reach therapeutic levels decreased. There was no difference in the time to reach or percent of patients who reached therapeutic levels in the first 24 hours. All groups had similar percent of subtherapeutic aPTTs at 24 hours and supratherapeutic aPTTs within the first 6 and 24 hours of starting heparin. There was however, a significant difference found in the number of patients subtherapeutic at 6 hours (p equals 0.006) with Group 1 having the highest percentage. Analysis of adverse events and length of stay found no difference between groups.

**Conclusion:** A significant difference in the average heparin infusion required to reach therapeutic anticoagulation was found between obese and non-obese patients. Data found in this study had similar findings to other studies that showed an inverse relationship between body weight and heparin dosing in a unit/kg basis. These findings help bridge the gap in understanding different dosing strategies of getting patients anticoagulated in a timely manner without putting them at an increased risk of bleeding.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-041

Poster Title: Evaluation of enoxaparin dose-capping in patients with obesity with subanalysis in patients with moderate renal impairment

Primary Author: Landon Neese, University of Iowa College of Pharmacy; Email: landon-neese@uiowa.edu

Additional Author(s):
Jamie Smelser

Purpose: Treatment doses of enoxaparin are calculated using body weight and can be given either once or twice daily. Although clearance of enoxaparin may be increased in patients with obesity, suggesting more frequent dosing is preferred, it is not known if the dose should be based on actual body weight. In addition, due to the paucity of data for patients with extreme body weight, some prescribers cap dosing. Adding to complexity is decreased clearance of enoxaparin in moderate renal impairment. This project assesses safety and efficacy outcomes of therapeutic enoxaparin in patients with obesity with a subanalysis in moderate renal impairment.

Methods: This IRB-approved, retrospective chart review was performed at the University of Iowa Hospitals and Clinics for patients over 18 years of age, with a body mass index (BMI) of greater than 30 kilograms per meters squared, who received enoxaparin treatment doses between 2010 and 2016. Patients who were prescribed enoxaparin for prophylaxis of thromboembolic conditions, had duration of therapy of less than 72 consecutive hours, or who had a creatinine clearance of less than 30 milliliters/minute were excluded. Information collected included actual body weight, ideal body weight, body mass index, enoxaparin dose, creatinine clearance, indication, and occurrence of bleeding or thrombosis. Dose-capping was defined as patients receiving a dose more than 15 percent less than the recommended therapeutic dosing based on total body weight. Moderate renal impairment was defined as an estimated creatinine clearance of 30 to 60 milliliters per minute. Data was analyzed using Microsoft Excel and SPSS Statistics. Independent samples T tests were done to determine significance, considered to be a p-value of less than 0.05. The primary objective was to determine if there is a difference in bleeding and thrombosis between patients with obesity who were dose-capped versus those who were not dose capped. In addition, descriptive statistics are reported for the doses and dosing regimens that were prescribed.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** Of the 802 patients analyzed, 88 (10.9 percent) were given a capped dose. In these patients, regardless of renal function, patients who were dose-capped had significantly higher weight and BMI, with a higher proportion of subjects receiving once versus twice daily dosing (p less than 0.001 for all). The dose-capped group also had a significantly higher rate of re-thrombosis and major bleeds (p less than 0.001 and equal to 0.009, respectively). There was a trend towards higher rates of minor bleeds and total bleeds (p equal to 0.060 and 0.0819, respectively) in the dose-capped group, although it was not statistically significant. Enoxaparin doses (in milligrams per kilogram) were significantly lower in the dose-capped group compared to those that were not dose-capped (p less than 0.001 for both once and twice daily dosing), with the prevalence of once daily dosing being higher in the dose-capped group (p less than 0.001). When comparing dose-capped patients with moderate renal impairment versus those without, there were no significant differences in minor, major, or total bleeds and no difference in re-thromboses. The same was true when comparing patients who were not capped. Additional analyses will be presented.

**Conclusion:** Overall, various bleeding events and re-thrombosis occurred more in obese patients who received capped doses of enoxaparin with doses significantly lower than those in non-capped patients. Though it would be logical that the risk of thrombosis is higher with lower-than-recommended doses, one might also expect bleeding to be lower with lower doses. However, there were more bleeds in the dose-capped group. It may be that prescribers are preemptively choosing lower doses in patients at high risk for bleeding.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-042

Poster Title: Comparison of adherence to manufacturer dosing recommendations with apixaban, dabigatran, and rivaroxaban therapy

Primary Author: Brittany Snyder, University Hospitals Geauga Medical Center; Email: brittany.snyder2@uhhospitals.org

Additional Author (s):
Mate Soric

Purpose: Among the non-warfarin oral anticoagulants, differences in manufacturer recommended dosing strategies may lead to inconsistencies in adherence to dosing guidelines between agents. This study compared the relative incidence of adherence to manufacturer recommended dosing strategies for apixaban, dabigatran, and rivaroxaban in the treatment of non-valvular atrial fibrillation.

Methods: A retrospective cohort study was performed using records from a large integrated health system and included patients ≥ 18 years of age receiving apixaban, rivaroxaban, or dabigatran with a diagnosis of non-valvular atrial fibrillation and admitted as inpatient or observation status for at least 24 hours. Exclusion criteria included treatment for deep vein thrombosis (DVT), pulmonary embolism (PE), secondary prevention of recurrent DVT or PE, or postoperative thromboprophylaxis. The primary outcome was the incidence of nonadherence to manufacturer recommended dosing strategies for apixaban compared to rivaroxaban and dabigatran therapy. A logistic regression model was developed to identify predictors of nonadherent prescribing patterns.

Results: A total of 136 patients with admission between September 2015 to September 2016 were included. There were no significant differences in baseline characteristics between groups, with the exception of the incidence of cardiology consults in patients receiving dabigatran (49%) when compared to patients receiving rivaroxaban (74%), and apixaban (71%, p=0.02). Upon analysis of the primary outcome, a significant difference was observed in the incidence of nonadherence to manufacturer recommended dosing strategies when apixaban (15.6%) was compared to rivaroxaban (30.4%), and dabigatran (40%, p=0.035). Upon utilization of a logistic regression model to identify predictors of nonadherence to manufacturer recommended dosing strategies, it was found that when compared to patients receiving

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
apixaban therapy, those who received dabigatran therapy where at least three times more likely to receive doses nonadherent to manufacturer recommended guidelines (OR: 3.52: 95% CI 1.21-10.30). When compared to patients without a history of bleeding events, patients who had a history of bleeding were at least four times more likely to receive doses nonadherent to manufacturer recommended guidelines (OR: 4.61: 95% CI 1.06-20.02).

**Conclusion:** This retrospective cohort study found a significant increase in the incidence of nonadherence to manufacturer recommended dosing strategies in patients receiving dabigatran therapy when compared to those receiving apixaban. Patients with a past medical history of bleeding were more likely to receive dosing that was nonadherent to manufacturer recommended dosing strategies.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-043

Poster Title: Evaluation of the dosing of 4 factor prothrombin complex concentrate (4FPCC) in acute major bleeding and preoperative management in patients on warfarin therapy

Primary Author: Sarah Sung, Doctors Medical Center of Modesto; Email: s_sung@u.pacific.edu

Additional Author(s):
Yee-Way Ting

Purpose: The FDA-approved indication for the use of 4-factor prothrombin complex concentrate (4FPCC) is urgent reversal of coagulation factor deficiency induced by warfarin therapy. And the FDA-approved dosing for 4FPCC is based on pretreatment INR and body weight. Studies have shown that higher rate of achieving post-treatment target INR is associated with dosing that parallels the FDA-approved dosing strategy. Standardization of 4FPCC dosing was identified to be necessary at our institution and a pharmacy protocol that adopted the FDA-approved dosing was implemented. This study is designed to evaluate the impact of a pharmacy protocol on 4FPCC dosing at a community hospital.

Methods: This study is a retrospective chart review of before and after implementation of a pharmacy protocol that standardized 4FPCC dosing. The study time periods are from July 1st 2015 to June 30th 2016 for pre-implementation period and from November 16th 2016 until April 6th 2017 for the post-implementation period. Effective on November 16th 2016, the pharmacy protocol for the use of 4FPCC was implemented. The protocol enabled pharmacists to adjust 4FPCC dose according to the FDA-approved dosing for the specific indication of reversal of warfarin’s effect for acute major bleeding or before emergency procedures. Another part of the protocol required pharmacists to contact the prescribers if there was no concurrent vitamin K orders, any pretreatment INR < 2, or any repeat doses of 4FPCC. Pharmacists were educated and emailed with the protocol. Primary endpoint examined the FDA-approved 4FPCC doses in the two study time periods. Secondary endpoint examined whether or not patients received concurrent vitamin K along with 4FPCC. Concurrent administration of vitamin K is recommended in order to maintain the level of clotting factors after 4FPCC’s effect has diminished, with the exception of patients who needed anticoagulation restarted right away after any emergency procedures.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: During the pre-implementation period, 20/26 patients (77%) received the FDA-approved 4FPCC dose and 16/26 (62%) received concurrent vitamin K administration. After implementation of the protocol, 4/4 patients (100%) received both the FDA-approved 4FPCC dose and concurrent vitamin K administration.

Conclusion: Implementation of a pharmacy protocol for 4FPCC use for the reversal of coagulation factor deficiency induced by warfarin reduced variation from the FDA approved dosing and increased concurrent vitamin K use.
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-044

Poster Title: Evaluation of the safety of venous thromboembolism prophylactic regimens in cirrhotic patients

Primary Author: Nisha Tahiliani, UF Health Jacksonville; Email: nisha.tahiliani@jax.ufl.edu

Additional Author(s):
Rachael Carloni
Denise Kelley
Marci DeLosSantos

Purpose: Liver cirrhosis causes imbalances in the anticoagulant and pro-coagulant status of the body due to altered production of clotting factors and proteins C and S. Despite this, the standard of practice is to prophylactically anticoagulate cirrhotic patients while hospitalized using pharmacologic agents or non-pharmacologic devices. However, with varying rates of thrombosis and bleeding reported, controversy exists surrounding the risk versus benefit of venous thromboembolism prophylaxis (VTEP) in this patient population. This research project aims to determine the safety of pharmacologic and nonpharmacologic VTEP in hospitalized patients with cirrhosis.

Methods: This was a retrospective, IRB approved, single center study of cirrhotic patients admitted to general medicine floors from 2012-2016. Patients who received prophylactic anticoagulation regimens of LMWH, unfractionated heparin (UFH), or sequential compression devices (SCD) for at least 48 hours were included. Electronic medical records were reviewed for cirrhosis etiology, length of stay, prophylaxis regimen, and risk factors associated with venous thromboembolic events. The primary endpoint was the prevalence of bleeding (defined as a documented bleed, decrease in hemoglobin >5 mg/dL within 10 days, intracranial hemorrhage, or decrease in hemoglobin of 3-5 mg/dL with witnessed bleeding within 10 days). Secondary safety endpoints included the prevalence of thromboembolic events, heparin induced thrombocytopenia, length of hospital stay, and in-hospital mortality rate.

Results: Of the 443 charts reviewed, 149 subjects met inclusion criteria with the largest reason for exclusion being a documented bleed in the past 6 months or currently prescribed therapeutic anticoagulation. The majority of the patients included were males (67%), with hepatitis (43%) as the most common etiology of cirrhosis. The average age of all patients
included was 56 years with an average Charlson Comorbidity Index of 5.8 and MELD score of 6.4. There were 65 patients who received LMWH for at least 48 hours, 50 patients who received UFH for at least 48 hours, and 34 patients who only had SCD placed with no chemical prophylaxis. Patients receiving LMWH had an in-hospital bleed rate of 10% (n=7) compared to those in the UFH group that had a bleed rate of 14% (n=7) and 5% (n=2) in the SCD arm, with a combined prevalence of 11% (n=16). There were no reported venous thromboembolic events in any arm of the study and only one documented heparin induced thrombocytopenia in the LMWH arm. The average length of stay amongst all participants was 5 days with no resulting in hospital mortalities.

**Conclusion:** With the controversies surrounding the risk of a venous thromboembolic event occurring versus a bleed in cirrhotic patients, the results of this study show that there is a low prevalence of both. Furthermore, it has been shown in one previous study that using LMWH may be safer than using UFH to prophylactically anticoagulate, while the results of this study show that using either agent is an equally safe option. This research further endorses the practice of anticoagulating cirrhotic patients to prevent venous thromboembolic events from occurring, despite previous thoughts that they may be at an increased risk of bleeding.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-045

Poster Title: Interaction between short-term administration of amiodarone and warfarin after cardiac surgery

Primary Author: Tomoki Takase, Kobe City Medical Center General Hospital; Email: t-takase@kcho.jp

Additional Author(s):
Hiroaki Ikesue
Hiroyuki Mima
Tadaaki Koyama
Tohru Hashida

Purpose: Postoperative atrial fibrillation after cardiac surgeries has been reported in approximately 30 percent of cases. Therefore, short-term intravenous amiodarone is sometimes necessary for the treatment of postoperative atrial fibrillation. Patients who have undergone valvular surgery or have atrial fibrillation also need warfarin. Many studies report interactions between these drugs, but there is a lack of information about the interactions between warfarin and short-term intravenous amiodarone in an ICU setting during the first few days after cardiac surgery. Thus, we investigated the influence of short-term intravenous amiodarone on the anticoagulation effect of warfarin in patients before and after cardiac surgery.

Methods: This retrospective study protocol was approved by the institutional review board at Kobe City Medical Center General Hospital, Japan. We examined the medical records of patients who received oral warfarin before and after cardiovascular surgery and received single loading of 125-150 mg and/or a 750 mg continuous infusion of amiodarone in the ICU, within 5 days of surgery, between July 2011 and January 2017. The patients were excluded if they received oral amiodarone or other drugs that were known to markedly alter the effect of warfarin during the study period. Eleven patients met the inclusion criteria. The patients were followed up 15 days after the initial dose of intravenous amiodarone. The daily doses of warfarin were adjusted as necessary to maintain a therapeutic PT-INR of 1.5-2.0. The PT-INR/daily dose of warfarin (PT-INR/dose) was used as an indicator of the anticoagulant effect. Prior to surgery, the doses of daily warfarin, PT-INR value, and PT-INR/dose ratio were stable in the study subjects; these values were defined as the baseline. The changes in PT-INR and PT-INR/dose ratio were analyzed by ANOVA and post-hoc analysis. Results: The patients included in this study were 6 men and 5 women. The mean age was 73.6 years (range, 52-83 years). The mean PT-INR/dose ratio was 1.24 (range, 1.0-1.6). The mean PT-INR/dose ratio was significantly lower after 5 days of surgery (p<0.05). Conclusion: Short-term intravenous amiodarone had a marked impact on the anticoagulation effect of warfarin. Further studies are required to determine the appropriate dose and timing of amiodarone administration in patients undergoing cardiac surgery.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
INR/dose were analyzed by using a paired t-test. All p values of less than 0.05 were considered to be statistically significant.

**Results:** Valvular heart disease is the most common cardiovascular comorbidity. Valve plasty or replacement was the most common indication for warfarin, and atrial fibrillation or flutter was the most common indication for amiodarone in our patients. The warfarin doses were stable before surgery. Compared with baseline values, PT-INR was prolonged in seven patients (63.6 percent) after the administration of amiodarone. Except for that in one patient, the daily warfarin doses were reduced after amiodarone injection. The PT-INR/dose ratio increased in 10 patients (90.9 percent) after amiodarone injection. Although the median time to reach the peak value of PT-INR/dose was 5 days after amiodarone injection, the values were not consistent in each case, and the mean values of PT-INR were not significantly different before (2.13 plus/minus 0.58) and after (2.29 plus/minus 0.50) amiodarone administration (p = 0.551). In contrast, the mean values of PT-INR/dose were significantly elevated after the administration of amiodarone compared with baseline value (0.92 plus/minus 0.45 vs 1.54 plus/minus 0.62, p = 0.002).

**Conclusion:** This is the first report to show that the short-term use of intravenous amiodarone enhanced the anticoagulation effect of warfarin in patients who were admitted to the ICU after cardiac surgery. This study showed that the values of PT-INR may be elevated for a few days after amiodarone injection. Therefore, the dose of warfarin should be carefully adjusted to minimize the risk of bleeding after cardiac surgery if intravenous amiodarone is also administered.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Cardiology / Anticoagulation

**Session-Board Number:** 7-046

**Poster Title:** Impact of a pharmacist-directed heparin-induced thrombocytopenia (HIT) service on the appropriateness of treatment and drug costs

**Primary Author:** Kayla Torphey, Newark Beth Israel Medical Center; **Email:** kayla.torphey@rwjbh.org

**Additional Author(s):**
Sheetal Patel
Leena Kansagra

**Purpose:** Heparin-induced thrombocytopenia (HIT) is a rare immune-mediated syndrome. A study was conducted at our institution in 2014 which showed less than four percent of patients were indicated to receive treatment for HIT with argatroban, resulting in over 500,000 dollars in drug wastage. Following this, a 24/7 on-call clinical pharmacy service was implemented that approved or denied argatroban requests and followed up on laboratory results until drug discontinuation. The purpose of this study was to evaluate the impact of a clinical pharmacy service on appropriateness of patients treated for suspected HIT and decrease in argatroban wastage compared to the pre-intervention period.

**Methods:** This was an institutional review board approved retrospective review of clinical data. Data was collected on all adult patients admitted to our institution treated for suspected HIT between January 5, 2015 and May 5, 2017. When argatroban was requested, the pharmacist approved or rejected the request using evidence-based criteria. If argatroban was approved, the patient was followed throughout the duration of therapy. Appropriateness of therapy compared to the pre-intervention period was analyzed using the Fisher’s exact test. The impact of the clinical pharmacy service on quality measurements and cost savings were evaluated using descriptive analyses.

**Results:** A total of 76 patients were evaluated for treatment for suspected HIT, in which 80 percent received treatment (95 percent with argatroban versus 5 percent with fondaparinux). After implementation of the pharmacist-directed HIT service, the number of patients treated with argatroban decreased from 112 to 58 and those indicated to receive argatroban based on evidence-based criteria increased from 3.57 percent to 94.8 percent (p less than 0.0001).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Compared to the pre-intervention period, the total cost of drug wasted went from $507,527 to $2,038.

**Conclusion:** The impact of a pharmacist-directed HIT service has dramatically lowered costs and increased appropriate treatment of suspected HIT.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Cardiology / Anticoagulation

Session-Board Number: 7-047

Poster Title: Impact of pharmacist interventions on the appropriateness of anticoagulation for the treatment of venous thromboembolic events (VTE) and prevention of adverse events

Primary Author: Kayla Torppey, Newark Beth Israel Medical Center; Email: kayla.torppey@rwjbh.org

Additional Author(s):
Sheetal Patel

Purpose: The venous thromboembolism (VTE) measures were developed as a result of a project between The Joint Commission and the National Quality Forum. VTE-3 is a compliance measure that assesses parenteral anticoagulant overlap with warfarin therapy. Between March 2014 and March 2015, our institution had 16 reported VTE-3 fallouts which lead to the formation of the VTE Task Force. The purpose of the study was to assess the impact of pharmacist involvement on the appropriateness of anticoagulation for the treatment of VTE and trend compliance data to evaluate the effect of a VTE task force on fallouts.

Methods: Data was collected on all adult patients admitted to our institution with a confirmatory test for VTE between March 1, 2015 and April 30, 2017. Each day a list of patients is emailed to the VTE Task Force members. This team consists of clinical pharmacy specialist, PGY1 pharmacy residents, members of quality management, and a physician champion. Pharmacy performs daily surveillance on all adult inpatients diagnosed with acute DVT or PE and qualifying patients are added to the surveillance tool by a pharmacist daily. Each patient on the list is assessed daily for compliance of overlap therapy for patients treated with warfarin, dosing and monitoring for all anticoagulants, documentation of reasons for discontinuation, and changes in clinical status requiring an intervention. All recommendations are given to the patient’s provider and documented. Noncompliance with recommendations are escalated to the physician champion as necessary and followed up in real time within 24 hours. Additionally, pharmacy contacts the primary physician by day 3 of warfarin therapy to promote compliance.

Results: This was an institutional review board approved retrospective review of clinical data. A total of 760 patients were evaluated for addition to the surveillance tool, in which 726 (95 percent) patients were included. 703 interventions were communicated to providers on 760 patients, of which 468 (67 percent) were directly related to prevention of a fallout. 156 (22

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
percent) and 79 (11 percent) interventions were made to prevent a medication error and an adverse event, respectfully. A total of 8 patients fell out in 2015 and 2016, of which 3 were a result of a break in the pharmacy process.

**Conclusion:** Daily surveillance of patients with confirmed VTE by a pharmacist has dramatically reduced the number of VTE-3 fallouts and improved the quality and safety of high risk anticoagulants at our institution.
Submission Category: Chronic / Managed Care

Session-Board Number: 7-048

Poster Title: Evaluation of an interactive heart failure certificate program at a community teaching medical center

Primary Author: Yekaterina Opsha, Rutgers University; Email: yekaterina.opsha@rwjh.org

Additional Author (s):
Jennifer Costello
Dipti Desai
Jim Palantine

Purpose: Heart failure (HF) is a chronic condition that affects approximately 5 million Americans. Regardless of practice setting, all pharmacists can participate in HF care, including: identifying and addressing adverse drug reactions, monitoring therapy, performing medication reconciliation and encouraging adherence. However, not all pharmacists have the necessary tools to adequately provide education to this patient group. We have observed some clinical gaps with respect to pharmacist HF knowledge which led to the creation of this program. The purpose of our study was to evaluate an interactive heart failure certificate program for pharmacists and its effect on documented interventions and their competency.

Methods: This study was approved by the institutions Investigational Review Board (IRB). All pharmacists at our medical center were invited to participate in this program from October 2016 to January 2017. The requirements to obtain the certificate included three modules. Module 1 required completion of a 1 hour ACPE accredited program on the topic of heart failure or completion of a 1-hour ACPE webinar in October 2016. Module 2 required completion off an online inbook on Heart Failure with accompanying patient case in November 2016. Lastly, module 3 required the completion of a live 30-min workshop on a patient counseling case with 1:1 role play with course instructor in January 2017. The certificate program provided a total of 3.5 ACPE accredited CEU’s. Sessions were offered across all shifts and on weekends. The primary endpoint of this study was to evaluate the effect of a heart failure education certificate program on documented interventions by pharmacists utilizing the student’s t-test. There were two secondary endpoints. The first was to identify changes in baseline knowledge with respect to congestive heart failure management utilizing the student’s t-test and the second was to evaluate pharmacist confidence in counseling patients with heart failure utilizing...
the Wilcoxon Rank Sum. An educational grant from Pharmacy Times was obtained to support this activity.

**Results:** A total of 38 pharmacists finished module one, 28 completed module two, and 27 completed all three modules and received the completion certificate. There were a total of 687 documented interventions prior to program implementation compared to 2,160 interventions post program implementation (p < 0.001). The average score for pharmacist competency pre-program was 89.4% compared to 98.1% post program (p < 0.01). Regarding pharmacist confidence, pharmacists reported feeling more confident post program implementation (p < 0.01).

**Conclusion:** A multicomponent education program can improve pharmacist knowledge, confidence and competence when providing individualized heart failure education to patients.
Submission Category: Chronic / Managed Care

Session-Board Number: 7-049

Poster Title: Preferred direct-acting antivirals across state Medicaid formularies with inclusion of sofosbuvir/velpatasvir

Primary Author: Ellyn Polley, University of Illinois at Chicago College of Pharmacy; Email: polley1@uic.edu

Additional Author(s):
Juliana Chan
Kelsey VandenBerg

Purpose: In June 2016, the Food and Drug Administration (FDA) approved sofosbuvir/velpatasvir (Sof/Vel) as the first direct-acting antiviral (DAA) to effectively treat all six hepatitis C virus (HCV) genotypes. Sof/Vel achieves a “virologic cure”, known as a sustained virologic response (SVR12), in over 95% of cases with consistent curable rates in every genotype. State Medicaid programs require prior authorization (PA) for all DAAs, regardless of the state’s preferred agent. Restrictions vary, causing inconsistent patient access across state boundaries. This study was conducted to compare state formularies for the inclusion of Sof/Vel as a preferred agent for every genotype.

Methods: An online search was conducted for all 50 of the United States’ Medicaid services. Following identification of the state website, the most recently updated preferred drug lists and prior authorization forms were reviewed by two different reviewers between May 22, 2017 and June 5, 2017. Each state Medicaid program was analyzed, and Sof/Vel was identified as a preferred, non-preferred, or non-formulary agent for all six genotypes. If the state had not yet approved Sof/Vel for use in a specific genotype or if the agent was not included on the state’s preferred drug list or PA form, it was labeled “non-formulary”. The findings were compared between states to assess the availability and accessibility of Sof/Vel to patients.

Results: All 50 states are included in our results. Out of the 50 states, 12 (24%) approve Sof/Vel regardless of genotype, and 5 states (10%) list Sof/Vel as a non-preferred agent for all genotypes. Only 3 states (6%) do not include Sof/Vel on their formulary. The remaining states varied in their designation of non-preferred versus non-formulary for genotypes 1, 4, 5 and 6. In 8 states (16%), Sof/Vel is only approved for genotypes 2 and 3. In 19 states (38%), Sof/Vel was preferred in genotypes 2 and 3, but other agents were preferred for genotypes 1, 4, 5, and

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
6. The remaining 3 states (6%) preferred Sof/Vel in genotypes 2, 3, 5, and 6. Sof/Vel has the highest recommendations for genotypes 2, 3, 5 and 6 regardless of cirrhosis status per the American Society for the Study of Liver Disease/Infectious Diseases Society of America (AASLD/IDSA) recommendations for testing hepatitis C. The guidelines also include Class I, Level A recommendations for Sof/Vel use in genotypes 1 and 4. Based on the results of the present study, 15 states (30%) followed the AASLD/IDSA guidelines by preferring Sof/Vel for all genotypes or preferring its use in genotypes 2, 3, 5 and 6.

**Conclusion:** Sof/Vel has inconsistent patient access between state Medicaid programs. After one year since the FDA approved the first DAA in the treatment of all genotypes, most states have restricted the use to only genotypes 2 and 3, whereas 12 states have listed Sof/Vel as a preferred HCV regimen. This data can be used by each state to identify how their HCV services align with the current clinical guidelines and in comparison to other state Medicaid programs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Chronic / Managed Care

Session-Board Number: 7-050

Poster Title: Hepatitis C prior authorizations: prudent cost saving measure or inconsistencies with guidelines?

Primary Author: Ellyn Polley, University of Illinois at Chicago College of Pharmacy; Email: polley1@uic.edu

Additional Author(s):
Kelsey VandenBerg
Juliana Chan

Purpose: Direct-acting antivirals (DAAs) are the treatment of choice for chronic hepatitis C (CHC). High DAA cost causes state Medicaid programs to restrict patient access by requiring prior authorization (PA) before approving therapy, such as a Metavir fibrosis score. The American Society for the Study of Liver Disease (AASLD) 2016 recommend treating all patients with CHC with no restrictions to staging for treatment. This study was conducted to compare the restrictions on Metavir fibrosis scores for approval of DAAs across state Medicaid plans.

Methods: An online search was conducted for all 50 of the United States’ Medicaid services. Once the state website was identified, the most updated PA forms and hepatitis C treatment criteria were reviewed by 2 individuals between May 22, 2017 and June 5, 2017. The minimum Metavir fibrosis score required for approval was documented by state. The scores range from F0 to F4, where F0 indicates no fibrosis and F4 suggests cirrhosis. States that did not have fibrosis restrictions or a minimum Metavir score of F0 were grouped together as “No Restrictions”. States that did not provide criteria on their website, in their prior authorization form, preferred drug list, or specific hepatitis C forms were labeled “unspecified” and removed from the total number of states evaluated.

Results: All 50 states were included in the original study. Eight states (16%) were labeled “unspecified” due to lack of information available through their state Medicaid website and were subsequently removed from the remainder of the analysis. A minimum Metavir fibrosis score of F3 was found in 15 states (35.7%), and another 15 states required a minimum score of F2. These data indicate that 30 states (71.4%) require evidence of moderate fibrosis before approving treatment. Only 3 states (7.1%) required a minimum Metavir fibrosis score of F1,

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
while 9 states (21.4%) have no restrictions. No state requires evidence of Metavir fibrosis score F4.

**Conclusion:** Though the criteria required for hepatitis C treatment with DAAs vary from state to state, the majority of the 42 states included in this study require a Metavir fibrosis score of either F2 or F3. Evidence from Medicaid services in each state indicates there is no consistency in Metavir fibrosis score requirements. Further studies must be conducted to better understand the factors that influence changes in the authorization of DAA treatment.
**Submission Category:** Clinical Topics / Therapeutics

**Session-Board Number:** 7-051

**Poster Title:** New analysis of pharmacist renal dosing interventions (NEPHRI) study

**Primary Author:** Michael Casias, Hunterdon Medical Center; Email: mcasias@hhsnj.org

**Additional Author (s):**
- Rani Madduri
- Ashmi Philips
- Mini Varghese
- Navin Philips

**Purpose:** There are a myriad of medications requiring dose adjustments in patients with renal insufficiency to prevent accumulation, which could lead to serious adverse events. Institutions have therefore, implemented policies for pharmacists to automatically adjust select medications based on current renal function. The purpose of this study was to evaluate pharmacist interventions on medications requiring dose adjustments for renal impairment.

**Methods:** This was a prospective study conducted from March to May 2017. The primary outcome was to assess the number of interventions pertaining to renal dose adjustments made by profiling pharmacists for select medications. Secondary outcomes included the number of follow-up interventions by pharmacists upon improvement in renal function and reasons for rejection of recommendations by prescribers. Patients in the study included those greater than 18 years old who received one of the following medications: meropenem, famotidine, ciprofloxacin, piperacillin/tazobactam, and ampicillin/sulbactam. The following patients were excluded: end-stage renal disease on dialysis, received one-time study medication orders, or if admitted to behavioral health, maternity, or pediatrics. The hospital’s electronic medical record (EMR) was utilized to collect basic patient demographics. Renal function was calculated using the Cockcroft-Gault equation unless the patient experienced an acute kidney injury in which the modification of diet in renal disease equation was used to assess renal function.

**Results:** Thirty-eight patients were analyzed. There were 18 orders requiring a dose adjustment for renal impairment. However, only 11 profiling interventions were documented (61 percent). Secondary endpoints included 11 follow-up interventions and one rejection from ordering providers for the dose adjustment.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Conclusion:** These results may reflect the inaccurately calculated renal function by the EMR in patients with fluctuating or low SCr levels. Furthermore, a pharmacist-driven renal program would be warranted utilizing a standardized approach to making interventions.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Topics / Therapeutics

Session-Board Number: 7-052

Poster Title: Optimization of corticosteroid dosing regimens for acute exacerbations of chronic obstructive pulmonary disease

Primary Author: Alyssa Claudio, UF Health Jacksonville; Email: alyssa.claudio10@gmail.com

Additional Author(s):
Denise Kelley
Benton Stamper
Rachael Carloni
Benedick Bato

Purpose: Currently there is limited data to guide corticosteroid dosing in patients demonstrating acute exacerbations of chronic obstructive pulmonary disease (AECOPD). Various dosing regimens are utilized in clinical practice, as previous studies have used inconsistent definitions for grouping patients by “low dose” and “high dose” prednisone equivalents. There is a lack of evidence to show that higher doses of corticosteroids reduce the risk of treatment failure. Corticosteroids have been associated with various adverse events including hyperglycemia and adrenal suppression. The purpose of this study was to identify a dosing regimen that would reduce adverse effects without sacrificing efficacy in AECOPD treatment.

Methods: This was a retrospective, dose-finding study of adult patients admitted to a medical floor at a large academic medical center with a diagnosis of AECOPD between August 2013 and August 2016. Patients must have received a systemic corticosteroid for > 72 hours after being admitted to the medical floor in order to be included. The primary outcome was the composite rate of treatment failure defined as the occurrence of any of the following: transfer to an ICU for respiratory decompensation, requirement of invasive or non-invasive mechanical ventilation, requirement of escalation of corticosteroid dose, in-hospital all-cause mortality, or readmission within 30 days of hospital discharge for a primary diagnosis of AECOPD. Secondary outcomes included length of hospitalization, prevalence of individual components of composite primary outcome, and prevalence of treatment-associated adverse events. Treatment-related adverse events were considered to be new or worsening hyperglycemia, invasive fungal infections, bacterial infections, or adrenal suppression.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: A total of 664 patient charts were screened and 170 were included in the study, with 100 in the treatment success group and 70 in the treatment failure group. Patients were mostly male (57%) and Caucasian (55%), with an average age of 62 years. The average daily dose of methylprednisolone equivalents received during the first 72 hours after admission was similar between the patients in the treatment failure group (median 124 mg, IQR 58.6- 186.7 mg) versus those in the treatment success (median 91.3, IQR 40-180) (p=0.08). No association between dose and treatment failure was identified in the multivariable analysis. A total of 65/170 patients (38%) experienced >1 adverse event, with the most common being new or worsening hyperglycemia. While the multivariable analysis did not reveal an association between dose and prevalence of adverse events, there were more adverse events identified in patients receiving > 40 mg of prednisone or equivalent (39.8%, 61/153 patients) than those receiving < 40 mg (23.5%, 4/17 patients) (p=0.18). The multivariable analysis found that the average daily dose was significantly associated with hospital length of stay (LOS) (p=0.012). For each one-milligram increase in the daily dose, the LOS was estimated to increase by one day.

Conclusion: Based on our study, in patients admitted for AECOPD, lower daily doses of corticosteroids were not associated with an increased risk of treatment failure. Patients with an average daily dose greater than the recommended prednisone 40 mg had a greater percentage of adverse events. Using a lower corticosteroid dose may reduce adverse effects and shorten hospital length of stay without sacrificing efficacy.
Submission Category: Clinical Topics / Therapeutics

Session-Board Number: 7-053

Poster Title: Reducing errors in the prescribing of medication orders for direct oral anticoagulants

Primary Author: Michael Mikrut, Comprehensive Pharmacy Services - Mercy Hospital; Email: mmikrut@ mercy-chicago.org

Additional Author(s): Sonali Muzumdar

Purpose: In recent years, approval of the direct oral anticoagulants (DOACs), apixaban, dabigatran, edoxaban, and rivaroxaban, has provided treatment options for many indications previously treated with warfarin. Studies have demonstrated that anticoagulants are often associated with adverse events due to errors in management. The direct oral anticoagulants are no exception since the dose, frequency, and length of therapy for each agent are different depending on the indication. The purpose of this project was to reduce prescribing errors for the direct oral anticoagulants.

Methods: Due to the complexity of dosing, numerous steps were taken over the past two years in an attempt to guide the ordering of DOACs and thereby decrease the number of prescribing errors for this medication class. As each agent was added to the hospital’s medication formulary, order sentences were created to guide the prescriber to the correct dosage regimen based on the indication. A dosing pocket card for the direct oral anticoagulants was created to assist the ordering physician and order verifying pharmacist. This pocket card contained dosing information for each DOAC medication, dosing recommendations regarding switching to or from warfarin, and guidance regarding the time necessary for interruption of direct oral anticoagulant therapy for surgical procedures. This was followed by the creation of an electronic alert which notified the pharmacist at order verification to go through a checklist and document in the electronic health record that the dose, frequency, and indication were correct. When discharge prescriptions were processed through the electronic health record, a dosing guidance window opened for the prescriber. An alert was sent by email to a pharmacist monitoring those prescriptions. The pharmacist reviewed the discharge prescriptions for accuracy based on the indication. If there were any discrepancies in dose, frequency, or length of therapy, the ordering prescriber was contacted by the pharmacist and corrections were recommended.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: Discharge prescriptions from February through June 2016 provided a baseline DOAC prescription error rate of 11% (16/142). After the guidance dosing window and DOAC dosing card were implemented, the discharge prescription error rate from July through September 2016 was 5% (4/80). Implementation of the pharmacist checklist in October 2016 was the final step put into practice. More errors were reported from October through December (10% (9/86)). The errors reported in 2016 were inconsistencies in dose, frequency, or length of therapy. Fifteen of the errors were incorrect doses and fourteen of the errors were incorrect dose and length of therapy. The prescriber was contacted by a pharmacist in each case and corrections were made. Between January and May 2017, 150 discharge prescriptions for direct oral anticoagulants have been reviewed. Eight prescriptions (5%) were found to have inconsistencies. Three apixaban and five rivaroxaban prescriptions, of which there were five dosing errors and three errors in both dose and length of therapy. All prescribing issues were corrected after a pharmacist contacted the prescriber.

Conclusion: Prescribing of direct oral anticoagulants can be challenging due to the complexity of their dosing regimens. Development of a comprehensive process for surveillance of direct oral anticoagulant prescriptions during hospitalization and upon discharge can result in a reduction in the rate of prescribing errors. One possible limitation to the improvement seen in the error rate after implementation could be that prescribers are becoming more familiar with the appropriate DOAC dosing and length of therapy.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Clinical Topics / Therapeutics

Session-Board Number: 7-054

Poster Title: A retrospective evaluation of parenteral calcitonin utilization for the management of hypercalcemia at a community teaching hospital

Primary Author: Oussayma Moukhachen, MCPHS University/Mount Auburn Hospital; Email: oussayma.moukhachen@mcphs.edu

Additional Author(s):
Patricia Masters
Christopher Dennis

Purpose: Parenteral calcitonin, a synthetic hormone, is indicated to treat acute symptomatic hypercalcemia in conjunction with hydration, a parenteral bisphosphonate and the nuclear factor kappa ligand monoclonal antibody, denosumab. Because of rising cost of parenteral calcitonin, we conducted a medication utilization evaluation (MUE) to evaluate the appropriateness of parenteral calcitonin usage for the management of hypercalcemia. The data collected provide necessary background to evaluate the need for a standardized protocol for the management of hypercalcemia at our institution.

Methods: A retrospective chart review was performed using the hospital’s electronic medical record. We included in this MUE all inpatients who had received at least one dose of parenteral calcitonin from October 1, 2014 through May 1, 2017. We collected the following patient characteristics: baseline laboratory data (serum albumin, creatinine, and corrected calcium), hypercalcemia etiology and severity, presenting symptoms and concomitant intake of hypercalcemic inducing medications. In addition, the calcitonin regimen (dose, number of doses, and duration), the administration of adjuvant therapy, the timing of the calcium level drawn after the first calcitonin dose and the first normal calcium level were recorded. We considered calcitonin administration appropriate when treating severe hypercalcemia defined by a (corrected calcium level ≤-14 mg/dl), dosed at 4 mg/kg subcutaneously or intramuscularly and used in conjunction with hydration and a bisphosphonate or denosumab. Monitoring was considered appropriate if a calcium level was drawn six to eight hours following a calcitonin dose. Each individual calcitonin dose was evaluated for appropriateness and the total cost of inappropriate doses was calculated.
Results: Parenteral calcitonin was administered to 18 patients for 22 hypercalcemic courses. Twelve patients were diagnosed with hypercalcemia of malignancy, while six patients were treated for hypercalcemia secondary to other causes. Thirteen of the 18 patients had severe hypercalcemia at the time they received their first dose of calcitonin. Sixty-three calcitonin doses were administered. Patients received an average of 3 doses per hypercalcemic course (range, 1-12 doses). The median dose used was 3.8 mg/kg. With respect to adjuvant therapy, hydration therapy was ordered during all hypercalcemic courses and bisphosphonates were administered in 19 (86%) courses while denosumab was not utilized. Regarding duration of hypercalcemic course, 13 (59%) resolved in < 24 hours, and 9 (40%) lasted beyond 24 hours. Four of 22 courses (18%) lasted more than 48 hours. Median time to normalization of calcium level was 4 days (range, 0.5 - 64 days). The timing of the first calcium level after the initial calcitonin dose was appropriate in 7 of 18 patients (39%). Forty-one of the 63 (65%) calcitonin doses were potentially inappropriate due to continuation of therapy beyond when calcitonin was indicated. We calculated an excess annual cost of parenteral calcitonin of greater than $26,000.

Conclusion: Overall, the management of hypercalcemia at our institution would benefit from adopting a standardized inpatient hypercalcemia treatment protocol. A multidisciplinary approach to developing and implementing this protocol involving pharmacy, inpatient medical staff and nursing might reduce excess calcitonin use and cost while optimizing the quality of hypercalcemia care.
Submission Category: Clinical Topics / Therapeutics

Session-Board Number: 7-055

Poster Title: Impact of an antibiotic stewardship strategy on aztreonam utilization in suspected penicillin-allergic patients

Primary Author: Jennifer Nickelson, Cardinal Innovative Delivery Solutions; Email: jennifer.nickelson@cardinalhealth.com

Additional Author (s):
Savannah Posey
Katherine Shea

Purpose: Cephalosporin use is often avoided in patients with a documented penicillin allergy even though risk of cross sensitivity to cephalosporins with dissimilar side chains (e.g., ceftriaxone, cefepime) has proven to be low (less than 2 percent). At our facility, aztreonam was being utilized routinely by the physicians as an alternative to cephalosporins for pseudomonal coverage in penicillin allergic patients. Based on the hospital’s 2012 antibiogram, Pseudomonas aeruginosa revealed the following susceptibility: aztreonam 58 percent, ceftazidime 86 percent, and cefepime 74 percent. Investigators sought to assess the impact of education and pharmacist led prospective audit on the utilization of aztreonam.

Methods: This was a single center, retrospective study comparing utilization before (July 2012 through June 2013) and after (July 2013 through June 2016) implementation of education and pharmacist led prospective audit of aztreonam. In March of 2013, the hospital’s Antibiotic Stewardship Committee approved a plan to educate pharmacists and physicians on aztreonam alternatives in suspected penicillin-allergic patients. The educational tool was an algorithm that focused on appropriate use of cephalosporins in patients with a history of a penicillin allergy noted in their medical record and included guidance on allergy assessment. Pharmacist and physician education was delivered annually beginning in April of 2013 via relevant committee and staff meetings. After the initial education was complete, pharmacists reviewed orders for aztreonam in penicillin-allergic patients to determine if a cephalosporin, or another appropriate alternative, could be safely administered based on the algorithm. Antibiotic utilization was assessed by days of therapy per 1000 patient days (DOT/1000 PD) using a Student’s T-test. Additionally, acquisition cost and Pseudomonas aeruginosa susceptibility were assessed throughout the time periods.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: The hospital experienced a statistically significant reduction in mean (SD) aztreonam DOT/1000 PD post implementation [19.6 (6.2) vs. 15.4 (5.6); p=0.04]. Additionally, aztreonam susceptibility vs. Pseudomonas aeruginosa increased from 59% in 2013 to 63-69% between calendar years 2014-2016. Aztreonam acquisition cost also decreased by $78,000 over the four-year period.

Conclusion: Education and pharmacist-led prospective audit targeting aztreonam use in penicillin-allergic patients through use of an approved algorithm decreased aztreonam utilization and acquisition cost with improvements in Pseudomonas aeruginosa susceptibility.
Submission Category: Clinical Topics / Therapeutics

Session-Board Number: 7-056

Poster Title: Obesity as a risk factor for Alzheimer's disease: literature review

Primary Author: Chirlie Silver, MCPHS University; Email: chirlie.sabbah@gmail.com

Additional Author(s):
Stefanos Torkos
Dhiren Patel

Purpose: Despite the fact that Alzheimer’s disease is the 6th leading cause of death in the US, no public health prevention strategies are in place. There is strong scientific evidence that pre-diabetes, metabolic syndrome, insulin resistance, type 2 diabetes and dysregulated insulin signaling in the brain are Alzheimer’s disease risk factors. Yet, little evidence is available assessing the benefit of treatment and/or prevention of these risk factors. This literature review aims to define obesity as an upstream risk factor for Alzheimer’s disease, and assess whether low cost interventions would be helpful in reducing the incidence of Alzheimer’s disease.

Methods: A literature search was conducted to summarize the evidence regarding the use of anti-diabetic and anti-obesity therapy for the treatment of Alzheimer’s disease. Also, to discuss which population to target and when to consider treatment as well as evaluate the pathophysiological and clinical evidence linking obesity and obesity-related diseases (i.e. insulin resistance, hyperglycemia and type 2 diabetes) with Alzheimer’s disease.

Results: Insulin resistance, higher BMI, and hyperglycemia have been associated with an increased risk of lower cognitive performance, cognitive decline and Alzheimer’s disease. Antidiabetic medications may be beneficial in preventing Alzheimer’s disease as impaired insulin signaling and glucose utilization have been connected to disease pathology. Dipeptidyl peptidase 4 inhibitors effectively reduce oxidative stress, and inflammatory hallmarks in the brain, which have been demonstrated to improve cognition. Glucagon-like peptide-1 receptor agonists have been associated with potential beneficial results in rodent studies and are currently being studied in humans. As of today, the most promising and robust results have been associated with the use of intranasal insulin.
Metabolically unhealthy obese (MHUO) patients are more likely to have metabolic derangements (insulin resistance, hypertension, large waist circumference, high triglycerides, low HDL cholesterol, elevated fasting glucose, and elevated intrahepatic triglycerides) than
metabolically healthy obese (MHO) patients. Weight loss has been shown to be beneficial in reducing these metabolic derangements, more so in MUHO as the incidence of these derangements is higher in this group. As these metabolic derangements are associated to Alzheimer’s disease’s pathogenesis, it is a reasonable conclusion to target MUHO individuals for weight loss interventions to decrease the risk of Alzheimer’s disease development.

**Conclusion:** Currently, there is insufficient evidence to establish superiority of any of these agents; more research is needed to establish the efficacy of anti-diabetic medications for the treatment and/or prevention of Alzheimer’s disease. Intra-nasal insulin seems to have the most promising results to date. Additionally, the current literature points to the metabolically unhealthy obese patients as the most likely to benefit from weight loss strategies, as a safe and efficacious approach to preventing Alzheimer’s disease.
**Submission Category:** Complementary Alternative Medicine (herbals, etc.)

**Session-Board Number:** 7-057

**Poster Title:** Asking the right question: a comparison of two approaches to gathering data on herbals use in survey based studies

**Primary Author:** Pallivalappila Abdulrout, Hamad medical corporation; **Email:** pabdulrout@hamad.qa

**Additional Author(s):**
Moza Al Hail Al Hail  
Derek Stewart  
James S Mc Lay

**Purpose:** Prevalence and nature of herbal medicines use by pregnant women has increased significantly. Such data are usually collected by means of a questionnaire survey, however a key methodological limitation using this approach is the need to clearly define the scope of ‘herbals’ to be investigated. The majority of published studies in this area neither define ‘herbals’ nor provide a detailed checklist naming specific ‘herbals’ and CAM modalities, which limits inter-study comparison, generalisability and the potential for meta-analyses. The purpose of this study was to compare the self-reported use of herbs and herbal products using two different approaches implemented in succession.

**Methods:** Cross-sectional questionnaire surveys of women attending for their mid-trimester (18-21 weeks, number: 332) scan or attending the postnatal unit (557) following live birth at the Royal Aberdeen Maternity Hospital, North-East Scotland. Data collection was completed in 2012 and study methods have been reported in details in our previous publications. The questionnaire utilised two approaches to collect data on ‘herbals’ use, a single closed yes/no answer to the question “have you used herbs, herbal medicines and herbal products in the last three months”; and a request to tick which of a list of 40 ‘herbals’ they had used in the same time period.

**Results:** A total of 889 responses were obtained of which 4.3% (38) answered ‘yes’ to herbal use via the closed question. However, using the checklist 39% (350) of respondents reported the use of one or more specific ‘herbals’ (p < 0.0001). The 312 respondents who reported ‘no’ to ‘herbals’ use via the closed question but “yes” via the checklist consumed a total of 20 different ‘herbals’ (median 1, interquartile range 1-2, range 1-6). The most frequently reported

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
‘herbals’ used were: raspberry tea or capsules 61% (126); ginger 29% (89); cranberry 22% (70); chamomile 16% (49); peppermint 12% (36); eucalyptus 8.3% (26); aloe 6.7% (21); grapefruit 6.4% (20); senna 5.4% (17); echinacea 4.5% (14); garlic beyond cooking 3.5% (11); ginseng 1.3% (4); 0.6% (2) each for aconite, nettle root, dong quai; 0.3% (1) each for barberry, bee pollen, blue cohosh, ginkgo biloba, and kava. Binary logistic regression did not identify and significant differences, in terms of demographics, between the two study patient cohorts.

Conclusion: This study demonstrates that the use of a single closed question asking about the use of ‘herbals’, as frequently reported in published studies, may not yield valid data resulting in a gross underestimation of actual use. Our findings may also have relevance for the practicing clinician who should adopt detailed checklists when asking about a patient’s use of ‘herbals’.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Complementary Alternative Medicine (herbals, etc.)

**Session-Board Number:** 7-058

**Poster Title:** Unlocking the niche for clinical trial pursuit: systematic review of experimental studies on tiger nut research

**Primary Author:** Miriam Ansong, Cedarville University School of Pharmacy; **Email:** mansong@cedarville.edu

**Additional Author (s):**
Nicole Stute

**Purpose:** Cyperus esculentus, known as tiger nut (TN), is a natural product well known for its nutritional value. However, the medicinal uses of TN are not widely studied, evidenced by few experimental studies. Presently, in vivo/in vitro research have found medicinal benefits in sickle cell, diabetes, libido, hyperlipidemia, and inflammatory diseases. The purpose of this study was to evaluate research data on medicinal uses of TN in a systematic review for clinical trial pursuit.

**Methods:** Published studies from inception to 2017 were pulled from PubMed, CINAHL, EMBASE and SCOPUS databases. Search terms employed were: Tigernut, Cyperus esculentus, nutritional, medicinal values, disease, health, plant, fiber, milk, or oil extract. Key words such as preclinical, in-vitro, in-vivo, and clinical were scanned to meet the criteria among the search results.

**Results:** A total of 19 articles were selected: 15 were in-vivo, 3 in-vitro, and 1 clinical studies. Of these articles, 21% were on hyperlipidemia, 26% on libido, 16% on diabetes, 16% on sickle cell, and 11% inflammatory diseases. Findings depicted promising results and statistically significance difference (p < 0.05) in hyperlipidemia, libido, diabetes, sickle cell, and inflammatory diseases. One study on hyperlipidemia showed no difference in effect.

**Conclusion:** Despite the promising results in preclinical studies, there is limited literature on clinical trials in these diseases. TN safety profile therefore warrants the pursuit of clinical studies specifically in a challenging and mortality driven diseases, such as sickle cell. The authors plan to utilize the evidence to pursue clinical study.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Complementary Alternative Medicine (herbals, etc.)

Session-Board Number: 7-059

Poster Title: Utilization of complementary and alternative medicine in Saudi patients with cardiovascular diseases

Primary Author: Eman Shorog, King Khalid University; Email: eshorog@kk.edu.sa

Additional Author (s):
Khalid Alburikan

Purpose: Complementary and alternative medicine is widely used by patients with cardiovascular diseases worldwide and may cause adverse drug events. Lacking of data to describe the nature of complementary and alternative medicine use in our population recognize the need to explore this area in order to improve patient health-related outcomes. The aim of this current study was to investigate the patterns of complementary and alternative medicine utilization in patients with cardiovascular diseases in Saudi Arabia including; prevalence, patient behavior and perception, patient-healthcare provider relationship, and the factors associated with their use.

Methods: This was a cross-sectional study conducted at the Cardiology Clinics of King Saud University Medical City, an academic tertiary health care center with a 900-bed capacity located in Riyadh, the capital of Saudi Arabia. The study had been approved by the King Saud University Medical City Institution Review Board Committee and informed consent signed by all the participants. Subjects included were adults aged 18 years or older with a documented diagnosis of cardiovascular disease and able to answer the survey questions. Participants were asked about their sociodemographic characteristics, medical history, and frequency of using complementary and alternative medicine. For this study, the definition of complementary and alternative medicine was including (OTC products, dietary supplements, and herbal supplements). Moreover, we investigated the participants’ sources of information about the safety and efficacy of complementary and alternative medicine and their reasons for utilization. Multivariate logistic regression analysis was conducted to examine the predictors of nonprescription medication use.

Results: A total of 209 participants completed the interview. The mean age of the participants was 56±15 years, and 110 (52.6%) were female. Of the 209 participants, 116 (55.5%) reported routine use of complementary and alternative medicine. Black seeds and garlic were the most
frequently used herbal products. Acetaminophen, cold/cough remedies, and ibuprofen were the most commonly reported over-the-counter drugs. Of the surveyed patients, 54 (46.5%) used complementary and alternative medicine to manage cardiovascular conditions specifically. The majority of the study participants assumed that complementary and alternative medicines were harmless (61.7%). Advice from friends and family was the primary source of information about complementary and alternative medicine (57.7%). Compared with other comorbidities, diabetes mellitus was associated with a higher use of complementary and alternative medicine (OR 2.18, 95%CI 1.106-4.307). None of the other socioeconomic variables was a predictor for a higher use.

**Conclusion:** This is the first study to assess the use of complementary and alternative medicine in patients with cardiovascular diseases in Saudi Arabia. Our study indicated that the routine use of complementary and alternative medicine was common for a number of reasons. Health care providers should proactively discuss complementary and alternative medicine use with their patients to avoid potential harmful outcomes and to reduce the economic burden.
Submission Category: Geriatrics

Session-Board Number: 7-060

Poster Title: Prevalence and predictors of antipsychotic prescribing in adults with Parkinson's disease: a national cross-sectional study

Primary Author: Richard Chan, Euclid Hospital - Cleveland Clinic; Email: richard.chan@uhhospitals.org

Additional Author(s):
Mate Soric

Purpose: The objective of this study is to evaluate the prevalence of and factors that are associated with prescribing antipsychotic medications in patients with Parkinson’s disease in an outpatient population.

Methods: This national cross-sectional study used data from the National Ambulatory Medical Care Survey (NAMCS) from 2005 through 2014, which was obtained through the Centers for Disease Control and Prevention website. The de-identified data sets were combined and evaluated to include patients that are at least 65 years old with diagnosis of Parkinson’s disease. Patients who had a diagnosis of bipolar disorder, schizophrenia, Lewy body dementia or secondary Parkinsonism were excluded from the study. The primary outcome was the rate of antipsychotic prescribing in patients who had Parkinson’s disease. Multivariate logistic regression was used to identify variables that were associated with prescribing antipsychotics in this patient population, including: patient demographics, payer type, co-morbid conditions and prescriber characteristics.

Results: A total of 845 patients met the inclusion and exclusion criteria for this study. These 845 patients represent a weighted total of 11,901,800 patients. Between 2005 and 2104, antipsychotics were started, reordered, or continued in 5.7% of office visits for Parkinson’s disease. A majority of patients were male (57.7%), Caucasian (80.8%), ≥ 75 years old (64.8%), used zero or one dopaminergic agent (65.7%), and paid with Medicare (76.2%). In the multivariate analysis, females had higher rate of antipsychotic prescribing compared to males (OR: 3.096, CI: 1.166-8.220), established patients had a higher rate of prescribing compared to new patients (OR: 4.831, CI: 1.353-17.391), neurologists were more likely to prescribe antipsychotics compared to primary care and internal medicine practitioners (OR: 12.437, CI: 7.298-21.196), other specialists, not including primary care, internal medicine and primary care,

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
were also more likely to prescribe compared to primary care and internal medicine practitioners (OR: 50.212, CI: 19.444-129.665). Patients that were from the South were at higher risk compared to the Northeast (OR: 4.946, CI: 1.386-17.652).

**Conclusion:** This national cross-sectional study found that antipsychotics were started, reordered, or continued in 5.7% of office visits for PD. The following were associated with higher rates of AP prescribing: female sex, previous office visit, southern location, and provider specialty.
Submission Category: Geriatrics

Session-Board Number: 7-061

Poster Title: Herpes Zoster (HZ) revaccination strategies: assessment of the potential HZ and post herpetic neuralgia case avoidance in the US for people previously vaccinated against HZ

Primary Author: Brandon Patterson, GSK; Email: brandon.j.patterson@gsk.com

Additional Author (s):
Desmond Curran
Desiree van Oorschot
Barbara Yawn

Purpose: Herpes zoster (HZ), commonly referred to as shingles, is a reactivation of latent varicella zoster virus in patients previously infected. Clinical characteristics of HZ include painful rash with potential complications, such as post herpetic neuralgia (PHN). It has been estimated that the annual cost burden of HZ in the United States (US) will increase from $628 million (M) in 2005 to $4.7 billion (B) in 2030; however, prevention of HZ is obtainable via vaccination. The aim of this study was to compare the potential impact on HZ and PHN case avoidance of two independent HZ revaccination strategies versus no revaccination.

Methods: A Markov model called ZONA (ZOster ecoNomic Analyses) was developed to follow the remaining lifetimes of patients aged 65 years and older who were previously vaccinated with a live-attenuated zoster vaccine (ZVL, Zostavax) five years earlier. Choices modeled were revaccination with a non-live subunit vaccine (HZ/su, Shingrix) versus no revaccination and revaccination with ZVL vs no revaccination. Individuals progressed through potential health states including healthy, HZ, PHN, natural and HZ-related death, and recurrent HZ health states. Demographic data were obtained from the US Census, along with CDC data to estimate the portion of this population previously vaccinated with ZVL (34.2%). Coverage for revaccination strategy was varied from 30% to 100%. Compliance for the second dose of the HZ/su vaccine was 69%. The incidence of HZ and the proportion of HZ individuals developing PHN were derived from published US-specific sources. Age-specific vaccine efficacy and waning rates were based on published clinical trial and persistence data. Incremental HZ and PHN case avoidance and numbers needed to vaccinate to avoid one HZ and then one PHN case were calculated.

Results: For the 16.33M US adults aged 65 years and older whom were previously vaccinated with ZVL, it was estimated that the HZ/su revaccination strategy would reduce HZ by 385
thousand (K) [30% coverage] to 1.28M [100% coverage] cases, compared to 70K to 232K cases from receiving ZVL, respectively over the individual’s estimated lifetimes. Furthermore, HZ/su would reduce PHN by 40K to 134K cases, compared to 12K to 39K cases using ZVL. The number needed to revaccinate with HZ/su to prevent one HZ case was 13 compared to 71 people with ZVL. The number needed to revaccinate to prevent one PHN case was 123 for HZ/su compared to 421 for ZVL.

**Conclusion:** Due to higher and more sustained vaccine efficacy, the HZ/su vaccine demonstrated superior case avoidance for HZ and PHN in the US as compared to the currently available ZVL when revaccinating patients aged 65 years and older previously vaccinated with ZVL.
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-062

**Poster Title:** Comprehensive decision analytic and cost-effectiveness modeling of posaconazole versus fluconazole as prophylactic systemic antifungals in patients with hematological malignancies in Qatar

**Primary Author:** Daoud Al-Badriyeh, College of Pharmacy Qatar University; **Email:** daoud.a@qu.edu.qa

**Additional Author(s):**
Wafa Al Marridi
Ibrahim El-Hijji
Amir Naoum
Shereen El Azzazy

**Purpose:** While cost-effectiveness evaluations of posaconazole against fluconazole, as antifungal prophylaxis therapies in immunocompromised cancer patients, exist in literature, these are local, not comprehensive and, importantly, do not represent practices in Qatar. In the Qatari setting, for example, prophylaxis discontinuation due to adverse drug reactions (ADRs), which is a major cost driver in studies, is not managed with the usual use of alternatives. Instead however, patients are observed until events are resolved. This study sought to investigate the cost-effectiveness of using prophylactic posaconazole versus fluconazole with hematologic malignancies who are undergoing chemotherapy or hematopoietic stem cell transplant (HSCT) in Qatar.

**Methods:** A decision analytic model was created to capture the consequences of the prophylactic use of each of posaconazole and fluconazole. The successful outcome was defined as 112 days without fungal infections, which included success with minor ADRs (not requiring discontinuation), success with major ADRs (requiring discontinuation), and the success with no ADRs. Therapy failure was defined as fungal infections during 112 days of therapy or the patient death. Underlying transition probabilities were mostly adopted from published trial data. Treatment patterns and resource use were locally extracted from the National Center for Cancer Care and Research (NCCCR) practice in Qatar, using medical records, expert panels, and the hospital purchasing departments. Cost inputs were obtained from the latest Qatari hospital sources, adjusted to 2017 costs. The perspective adopted was that of the Qatari public hospital. As appropriate, only direct medical costs were considered, including costs of medications and

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
their administration, therapies to manage ADRs, alternative antifungal agents in cases of failure, hospitalization, and the relevant diagnostic, laboratory, and monitoring tests conducted. One-way sensitivity analyses, scenario analysis and probabilistic analysis were undertaken by the Monte Carlo simulation, via @Risk 7.5, to confirm robustness and enhance generalizability. The institutional ethics approval was granted as appropriate.

**Results:** Compared with posaconazole, fluconazole had similar success rate (with no major ADRs) of 0.75 versus 0.76. However, the average cost with posaconazole was greatly higher than with fluconazole (QAR 134,116 versus QAR 80,463 per patient). Incremental cost-effectiveness ratio (ICER) was conducted to reveal additional cost of almost QAR 4,000,000 with each case of success treated with posaconazole over fluconazole. A similar trend was observed with the cost of major side effects (QAR 50,871 versus QAR 39,131 per patient), and with the cost of management of therapy failure, being more than two times higher with posaconazole than with fluconazole (QAR 162,721 versus QAR 67,995). The patient management costs for both alternatives were comparable (QR 50,345 to QAR 45,033). The cost-effectiveness probability curve confirmed the study conclusion in 96% of cases.

**Conclusion:** Contrast to published findings, and based on the local Qatari practice, it seems that fluconazole is economically superior over posaconazole, with similar clinical effectiveness, for prophylaxis against invasive fungal infections among patients undergoing chemotherapy or HSCT due to hematological malignancies. There is a need for the Qatari decision makers to reassess their current practices at NCCCR of favoring posaconazole over fluconazole as a first-line prophylactic therapy in hematology cancer patients. This enables a more efficient utilization of the departmental resources and budgets at the hospital.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-063

Poster Title: Cellulitis admissions in a large academic health-center: medication use evaluation and patient characterization

Primary Author: Maxwell Anderegg, University of Iowa College of Pharmacy; Email: maxwell-anderegg@uiowa.edu

Additional Author(s):
Jamie Smelser

Purpose: One of the most common reasons for hospital admission is cellulitis. Many patients presenting to the emergency department are transferred to an inpatient hospital unit for intravenous antibiotics. In a health-system environment where census has been consistently high and Diagnosis-Related Group (DRG) reimbursement low, it is becoming increasingly more important to identify patients who are fitted for outpatient antibiotics. This project was designed to identify and characterized low-risk cellulitis patients for potential outpatient monitoring and treatment.

Methods: A health-system pharmacy manager generated a Vizient report which identified patients who presented to the University of Iowa Hospitals and Clinics (UIHC) and had a 10th revision of the International Statistical Classification (ICD-10) code related to cellulitis billed any time during a hospital stay between 01/01. A pharmacy student then performed a retrospective chart review with the identified patients to determine the following characteristics: use of outpatient antibiotics, whether surgery had been performed in the previous 30 days, location of cellulitis, whether systemic symptoms (tachycardia, fever >100.4F, abnormal glucose >110 mg/dL, white blood cell (WBC) elevation >11,000 cells/mm3) or clinical features (sepsis, bacteremia, osteomyelitis, necrotizing fasciitis, endocarditis, acute renal failure) were present at admission, and all antibiotics used during hospital stay. Inclusion criteria for the analysis were cellulitis, abscess, animal or human bite, periodontitis, tenosynovialitis, or post-surgical infection-related ICD-10 code. Exclusion criteria included: non-cellulitis related admission, >1 systemic symptom at admission, and facial (pre-septal, peri-orbital) cellulitis. Further stratification was performed following initial analysis to identify patients with no systemic symptoms or clinical features and those with isolated leukocytosis (WBC >11,000 cells/mm3). One additional retrospective chart review was performed to by a pharmacy student to

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
objectively determine based on clinical profile at admission, whether inpatient stay was warranted. Sixty-seven patients were included in this analysis.

**Results:** Based on an analysis of 67 patients presenting to UIHC we found that 59.7% of patient should not have been admitted for IV antibiotics. Based on the initial stratification of 93 patients with minor severity of illness, 43% of patients could have been treated as outpatients. Non-surprisingly, thirty percent of patients were treated with intravenous vancomycin in the emergency department and 43% were treated with intravenous vancomycin.

**Conclusion:** A large percentage of the patients admitted to UIHC for mild cellulitis likely could have been treated as outpatients considering both lack of systemic symptoms and availability of new agents like dalbavancin and oritavancin. These agents could be administered in the emergency department and circumvent hospital admission for multiple courses of IV antibiotics.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-064

Poster Title: The use of a novel prediction tool coupled with oral vancomycin prophylaxis to prevent Clostridium difficile infection

Primary Author: Allyssa Anderson, Purdue University; Email: ander361@purdue.edu

Additional Author(s):
Nicholas Van Hise

Purpose: Clostridium difficile infections (CDIs) have become a global issue within hospitals, communities, and various healthcare settings. CDIs may be associated with significant illness, occasional deaths, and are characterized by frequent recurrences. As CDIs continue to become an increasing issue worldwide, the use of oral vancomycin prophylaxis (OVP) has become essential for the prevention of CDI, especially recurrent CDI. With increasing publications regarding the use of OVP, the goal of this research is to couple a novel prediction tool with OVP to prevent the initial bout of CDI.

Methods: A pharmacist with advanced training (specialty residency) in infectious diseases created a prediction tool which identifies patients based on risk factors for CDI who would develop CDI at least 48 hours prior to their acquisition. This prediction tool has been built into the electronic medical record (EMR) for easy screening. All patients within a 300-bed community hospital are screened through the EMR to assess if their risk status reaches the cut off threshold to start OVP for prevention of CDI. The prediction tool is associated with greater than 95% sensitivity and specificity for identifying patients who would develop CDI. At the time of screening, if the patient reaches the desired threshold to put them “at risk,” the patient would be started on OVP. This OVP is continued for the entire period that the patient is at risk, whether that be on inpatient or outpatient.

Results: To date, greater than 1,000 patients have been screened and 154 have been started on OVP that have met the threshold. Within this group of 154 patients, 0 patients have developed CDI. OVP was continued in all patients for the entire time that they were at risk. The majority of patients were able to stop their OVP on discharge. Additionally, the entire hospital has had no nosocomial acquired infections since implementation of the prediction tool. The screening happens at least once daily and will continue to happen for a total of 3 months to obtain an
adequate data set. This group will ultimately be compared to a retrospective control group prior to the implementation of the prediction tool.

**Conclusion:** Our findings demonstrate positive results for the potential use of the prediction tool coupled with OVP to prevent CDI in any patient at risk. CDI is associated with high morbidity, mortality, and a dramatic cost to the healthcare system. Keeping in mind that OVP is associated with no side effects and arguably no potential resistance, this has the potential to become a standard of care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-065

Poster Title: Targeted antimicrobial stewardship strategy to reduce inappropriate fluoroquinolone use

Primary Author: Brittany Bates, Lima Memorial Health System; Email: bbates@limamemorial.org

Purpose: The overuse of fluoroquinolone antibiotics has been associated with many adverse outcomes since their introduction to the market. Given recent Food and Drug Administration (FDA) safety communications and approved labeling changes for these agents, an opportunity exists for antimicrobial stewardship programs to make meaningful interventions to reduce use. This project was designed to educate providers and target specific patients through antimicrobial stewardship in order to reduce fluoroquinolone days of therapy (DOT) and inappropriate use for inpatients at a community hospital.

Methods: A continuing education program was designed to increase awareness of the recent FDA safety communications related to fluoroquinolones and describe alternative antibiotic choices. Written communication in the form of a flyer was distributed electronically and posted throughout the facility in offices, lounges, and patient care areas where physicians and other prescribers were expected to see. After the initial education was completed, the antimicrobial stewardship began prospectively reviewing all inpatient fluoroquinolone orders for indication and appropriateness. Specific recommendations for alternative antimicrobials were communicated to providers if the patients were being treated for acute bacterial sinusitis (ABS), acute bacterial exacerbation of chronic bronchitis (ABECB), and uncomplicated urinary tract infections (UTI). Data collected during a 3 month timeframe after the educational efforts included pharmacist interventions and systemic fluoroquinolone days of therapy (DOT) compared to the previous year. DOT was calculated and reported per 1000 inpatient days.

Results: During the 3 month timeframe after education was completed pharmacists documented 31 interventions relating to de-escalating or discontinuing fluoroquinolones. The recommendations were accepted in 29 of the cases, yielding a 93.5% acceptance rate. These interventions were primarily made by the antimicrobial stewardship pharmacist and PGY1 resident; however interventions were logged by several other clinical and staff pharmacists. Inpatient ciprofloxacin use decreased by 10.7 DOT (adjusted per 1000 inpatient days) from the 2016 to 2017 time periods.
**Conclusion:** The message of limiting fluoroquinolone use was embraced by the pharmacy staff and antimicrobial stewardship team. The high acceptance rate of interventions made regarding fluoroquinolone use indicates that providers were receptive to modifying therapy. These interventions coupled with heightened awareness about appropriate fluoroquinolone use were likely responsible for the reduction in ciprofloxacin DOT observed.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-066

Poster Title: Comparison of fluoroquinolone versus non-fluoroquinolone therapy for the treatment of community acquired pneumonia

Primary Author: Abdel Bello, St Vincent’s HealthCare Riverside; Email: abdel.bello@jaxhealth.com

Additional Author(s):
Bryan Allen
Luke Miller
Sarah Hayes

Purpose: The purpose of this study was to evaluate the safety and efficacy of fluoroquinolone monotherapy compared to other recommended therapies for the treatment of community-acquired pneumonia in the inpatient setting.

Methods: This study was a multi-center retrospective cohort study that included hospitalized subjects at least 18 years of age with a clinical diagnosis of community-acquired pneumonia and that received at least 48 hours of antibiotics. The primary outcome was the rate of clinical stability without clinical failure in patients receiving fluoroquinolone monotherapy versus non-fluoroquinolone antibiotics. Secondary outcomes included 30 day readmission, length of stay, mortality and rate of Clostridium difficile infection. The primary outcome was evaluated using the Farrington-Manning test for non-inferiority with a predetermined margin of 10% actual difference between groups. For all other comparisons, Mann-Whitney-U test, t-test, Chi-square or Fisher’s exact test were used when appropriate.

Results: The primary outcome occurred in 153 patients in the fluoroquinolone group compared to 159 patients in the non-fluoroquinolone group demonstrating non-inferiority (p-value=0.0009). Although not statistically significant, more patients in the fluoroquinolone arm were readmitted within 30 days (18% vs. 11.5%; p=0.105). Median hospital length of stay (5 days vs. 4.9 days; p=0.390) and in-hospital mortality rates (2.5% vs. 1%; p=0.449) were similar between arms. In addition, the total number of confirmed Clostridium difficile cases during admission (3 vs. 2; p=1) and median in-hospital antibiotic duration (4.6 days vs. 4.1 days; p=0.657) were comparable.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Conclusion: This study demonstrated that non-fluoroquinolone therapy is non-inferior to fluoroquinolone therapy with regards to clinical efficacy. The use of fluoroquinolones has been associated with adverse effects such as tendonitis, increase risk of Clostridium difficile and the development of multidrug resistant organisms. Because of these adverse effects, some hospitals have adapted a fluoroquinolone restriction policy. When added to other literature, this study may help advocate for strategies that can reduce fluoroquinolone exposure and the development of associated negative outcomes.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-067

Poster Title: Minimally invasive antimicrobial stewardship: use of electronic medical record (EMR)-based alerts to maximize provider awareness of recommendations

Primary Author: Nicholas Bennett, Saint Luke's Health System; Email: ntbennett@saint-lukes.org

Additional Author(s):
Sarah Boyd

Purpose: Various communication approaches are deployed by antimicrobial stewardship programs (ASP) to ensure a timely response and high degree of acceptance of therapy recommendations. Communication ranges from direct verbal feedback, through de-centralized pharmacists, or progress notes in the electronic medical record (EMR), among others. Saint Luke’s Health System’s ASP is centralized across 10 hospitals, encompassing over 1,200 licensed beds with only 1.5 full-time clinicians, thus requiring broad reach with limited resources. To improve efficiency we implemented an EMR-based provider best practice alert (BPA) containing information from progress notes to ensure recommendation transparency and enhanced responsiveness.

Methods: The system-wide ASP was launched in August 2015. Progress notes in the EMR were one of three primary means of communication to providers and utilized when immediate action was not essential (e.g. de-escalation). In August 2015, the initial progress note process was passive and required providers to find and read the note. However, notes often required in person or electronic follow up to alert provider of recommendation. Subsequently, in August 2016 the ASP developed a BPA containing information from the progress note which displays to all providers when opening the patient chart. Providers may select the following options regarding the ASP recommendation: accept, decline, evaluation in progress, or not making antimicrobial decisions. The alert stops firing only if a provider declines the recommendation. Individual provider BPA responses are tracked in the background. Overall acceptance or rejection of ASP recommendations are tracked in a separate database.

Results: Of the 1,992 recommendations offered to providers from August 2015 to May 2017, 41.8% were through progress notes in the EMR. Acceptance rates were 87.5% pre-BPA, 92.2% post-BPA, and 89.7% cumulatively. Of the 1,090 pre-BPA recommendations, 438 (40.2%) were

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
provided through a progress note with a 79.2% acceptance rate. Of the 902 post-BPA recommendations, 395 (43.8%) used notes with an 86.1% acceptance rate. Overall monthly acceptance rates have not fallen below 90% since BPA implementation. De-escalation (61.3%), optimization of therapy (18.7%), escalation (10.7%), and ID consult (6.2%) were most common.

**Conclusion:** The use of provider BPA’s containing ASP progress note information improves provider awareness, responsiveness, and acceptance of ASP recommendations. Stewardship programs can use such EMR tools to maximize their efficiency and effectiveness with limited resources.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-068

Poster Title: Utilizing phase 3 clinical trial data to assess adverse event (AE) frequency of a potentially interacting medication (PIM) amlodipine with elvitegravir/cobicistat (EVG/COBI)

Primary Author: Sunny Choe, Gilead Sciences, Inc; Email: sunny.choe@outlook.com

Additional Author (s):
Daniel Podzamvzer
Karen Tashima
Ian McNicholl
Scott McCallister

Purpose: EVG/COBI, when combined in a single tablet regimen (STR) with emtricitabine/tenofovir-alafenamide (F/TAF), has shown high rates of efficacy as well as improvements in bone and renal safety in treatment-naïve and -experienced patients compared to the EVG/COBI/F/tenofovir disoproxil fumarate (EVG/COBI/F/TDF) STR. Amlodipine is a PIM that has a caution and recommendation for clinical monitoring when co-administered with either EVG/COBI/F/TAF or EVG/COBI/F/TDF. The clinical consequences of this co-administration were evaluated in nine large phase 3 clinical trials.

Methods: Data was retrospectively pooled from five treatment-naïve studies (GS-US-292-0104, GS-US-292-0111, GS-US-236-0102, GS-US-236-0103, GS-US-236-0128) and four treatment-experienced studies (GS-US-292-0109, GS-US-292-0112, GS-US-236-0115, GS-US-236-0121) to assess AEs associated with concomitant use of amlodipine. All participants received either EVG/COBI/F/TAF or EVG/COBI/F/TDF STR. Drug-specific AEs were obtained from Micromedex and Lexi-Comp. AEs occurring in greater than 10 percent of participants, AEs leading to premature discontinuation and drug-specific, grade 2-4 AEs were evaluated by performing statistical comparisons between users and non-users of amlodipine using two-sided Fisher exact tests.

Results: Of the 4,667 study participants, 153 received amlodipine (mean age 50 years, 75 percent male and 46 percent Caucasian). There was no statistically significant difference in all grade AEs between amlodipine users and non-users (49 percent vs 47 percent, respectively). However, amlodipine users had higher rates of drug-specific AEs compared to non-users (14 percent vs 5.3 percent, respectively; p less than 0.001). The drug-specific AEs with and without

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
amlodipine were peripheral edema (4.6 percent vs 0.4 percent, respectively; p less than 0.001) and nervous system disorders (2.6 percent vs 0.8 percent, respectively; p equal to 0.035). Although participants on amlodipine had a higher overall STR discontinuation rate than non-users (5.2 percent vs 2.3 percent, respectively; p equal to 0.031), only one discontinuation event could be considered due to an amlodipine-specific AE (local swelling).

**Conclusion:** Overall AEs and discontinuations due to drug-specific AEs were similar in participants that did or did not use concomitant amlodipine. Amlodipine-specific AEs were higher for participants using amlodipine, but only one participant discontinued EVG/COBI/F/TAF or EVG/COBI/F/TDF due to an amlodipine-specific AE. Because EVG/COBI/F/TAF or EVG/COBI/F/TDF can increase the level of amlodipine when co-administered, clinical monitoring is recommended.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-069

Poster Title: Long-term efficacy and safety of tenofovir alafenamide (TAF) versus tenofovir disoproxil fumarate (TDF) in treatment-naïve Asian adults

Primary Author: Sunny Choe, Gilead Sciences, Inc; Email: sunny.choe@outlook.com

Additional Author(s):
Shinichi Oka
Ploenchai Chetchotisakd
Damian McColl
Scott McCallister

Purpose: TAF is non-inferior in efficacy to TDF and has an improved renal and bone safety profile. In this sub-analysis, we describe the efficacy and safety of a TAF-containing single-tablet regimen (STR) compared to a TDF-containing STR in treatment-naïve Asian adults.

Methods: Pooled data from two Phase 3, randomized, double blind clinical studies (GS-US-2920104 and GS-US-292-0111) of HIV-infected, treatment-naïve adults who initiated treatment with an STR of elvitegravir, cobicistat, emtricitabine with either TAF (E/C/F/TAF) or TDF (E/C/F/TDF) were used to examine the efficacy and safety of the two regimens through Week 96 in self-identified Asian adults.

Results: Of the 1,733 study participants, 10 percent were Asian (91 E/C/F/TAF vs 89 E/C/F/TDF). Among Asian participants, baseline (BL) characteristics were balanced between the treatment groups (median age: 30 vs 31 years; CD4 count less than 200 cells per microliter: 15 vs 17 percent; eGFR: 109 vs 105 mL per min; proteinuria: 8 vs 8 percent, respectively). Week 96 comparisons of E/C/F/TAF vs E/C/F/TDF outcomes showed virologic suppression rates of 97 vs 93 percent by FDA snapshot analysis, CD4 cell count increases of 287 vs 250 cells per microliter, and one vs two percent discontinuation rates due to adverse events (AEs), respectively. There were no discontinuations due to renal AEs and no cases of proximal renal tubulopathy or Fanconi’s syndrome. Median changes in eGFR were -7 mL per min for E/C/F/TAF and -9 mL per min for E/C/F/TDF. Median decreases in proteinuria were 0 vs 34 percent UPCR; less than 1 vs 18 percent UACR; 12 vs 72 percent RBPCR; -38 vs 22 percent B2MCR for E/C/F/TAF vs E/C/F/TDF, respectively, and there were significantly less spine and hip bone mineral density...
losses for E/C/F/TAF vs E/C/F/TDF. Total median cholesterol to HDL ratios were 3.5 for E/C/F/TAF and 3.5 for E/C/F/TDF.

**Conclusion:** TAF and TDF STRs have high and durable efficacy in treatment-naïve Asian adults, with changes in markers of renal and bone safety consistently favoring E/C/F/TAF over E/C/F/TDF. The greater median decreases from baseline in proteinuria for E/C/F/TAF vs E/C/F/TDF suggest that TAF has less impact on renal tubular function than TDF. The decreases in eGFR were similar in both arms and consistent with cobicistat’s reversible inhibition of creatinine secretion. Taken together, these data support the use of a TAF-based regimen for the initial treatment of HIV in Asian adults.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-070

Poster Title: Impact of conversion from polymerase chain reaction to glutamate dehydrogenase plus toxin enzyme immunoassay testing on treatment of Clostridium difficile infections

Primary Author: Hee Jae Chung, San Joaquin General Hospital; Email: hchung@sjgh.org

Additional Author(s):
Jered Arquiete
Kyung Rim Kim

Purpose: Clostridium difficile infection (CDI) remains a leading cause of hospital morbidity and mortality. Rapid and accurate diagnosis by laboratory methods remains a challenge. Polymerase chain reaction (PCR) testing does not have the ability to detect actual toxin production, and therefore may lead to overtreatment of colonized patients. A diagnostic method that can differentiate between colonization and infection could minimize unnecessary antibiotic treatment. The purpose of this study was to assess whether or not the transition from PCR testing to the glutamate dehydrogenase (GDH) toxin enzyme immunoassay (EIA) testing will produce a difference in the number of patients treated with antibiotics for suspected CDI.

Methods: This was a single center observational study with retrospective and prospective phases. The retrospective phase consisted of reviewing the charts of all patients with positive PCR test results between June 23, 2015 and June 23, 2016. The prospective phase consisted of reviewing the charts of all patients with GDH positive and toxin EIA positive results and GDH positive and toxin EIA negative results between June 24, 2016 and February 28, 2017. Charts were reviewed for admitting and discharge diagnosis, documentation of symptoms of diarrhea, time and type of test performed, duration and type of medication given, total cost of medications, outcomes with or without treatment, complications of CDI, and death within 30 days. The primary endpoint was a comparison of the antibiotic exposure rate in the two study phases. Secondary endpoints included the total cost of antibiotics, the number of CDI related complications, CDI related mortality, and the number of hospital onset cases of CDI in each study phase.

Results: There were a total of 80 patients in the retrospective (PCR) group, and 39 patients in the prospective phase with 29 patients in the GDH positive toxin EIA negative group and 10...
patients in the GDH positive toxin EIA positive group. Baseline characteristics were similar between all groups. The total antibiotic days were 935 in the PCR group, 229 in the GDH positive toxin negative group, and 214 in the GDH positive toxin positive group. The combined total antibiotic days in the prospective phase was significantly decreased compared to the retrospective phase (443 vs. 935, \( p = 0.006 \)). Overall 96 percent of patients received antibiotics in the PCR group, compared to 31 percent of patients in the GDH positive toxin EIA negative group. The PCR group and the GDH positive toxin positive group each had 1 CDI related complication and 1 CDI related death. The total hospital onset cases of CDI were 32 in the PCR group, zero in the GDH positive toxin EIA negative group, and 4 in the GDH positive toxin EIA positive group. There was a notable decrease in total antibiotic costs from 12,576 dollars during the retrospective phase to 7,354 dollars during the prospective phase.

**Conclusion:** Transition from PCR to GDH toxin EIA testing significantly decreased the number of patients treated with antibiotics for CDI. There were no CDI related complications or deaths in the GDH positive toxin EIA negative group indicating this testing method does not underdiagnose patients with CDI. Conversion to GDH toxin EIA testing also led to a decrease in total antibiotic costs and a decrease in the number of hospital onset cases of CDI.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-071

Poster Title: Antibiotic utilization and patient outcomes with indeterminate Clostridium difficile testing

Primary Author: Stephen Cook, University of Charleston School of Pharmacy; Email: stephencook@ucwv.edu

Additional Author(s):
Jessica Robinson
Michaela Leffler
Stephanie Thompson
Vicky Tran

Purpose: Testing for Clostridium difficile is not nationally standardized; however, many institutions use a two-step or modified two-step method. Charleston Area Medical Center utilizes a modified two-step process that reports initial glutamate dehydrogenase/enzyme immunoassay (GDH/EIA) inconclusive results as indeterminate until a confirmatory polymerase chain reaction (PCR) test is complete. The purpose of this study is to determine if initial indeterminate GDH/EIA tests are associated with extended antibiotic use or delayed antibiotic initiation, and to examine associated patient outcomes (length of stay and mortality).

Methods: This study was a retrospective chart review of patients admitted to Charleston Area Medical Center during 2014 that were tested for Clostridium difficile infection. Of the 3,854 patients tested during the study year, 400 were randomly sampled using SPSS v. 19 software. Patients were excluded if they had a recent positive Clostridium difficile test or were receiving outpatient treatment for Clostridium difficile infection. Subjects with confirmatory polymerase chain reaction (PCR) positive results were compared to subjects with positive results by glutamate dehydrogenase/enzyme immunoassay (GDH/EIA) testing to determine if delay in results impact time to antibiotics, mortality, or hospital length of stay. Negative results by PCR were compared to initial negative GDH/EIA testing to determine if antibiotics duration differs when empirically ordered. Severity of illness based on American College of Gastroenterology Guidelines (mild/moderate, severe, or severe/complicated), treatment (no treatment, metronidazole, and/or vancomycin) concurrent infections or antimicrobial usage, and patient demographics were also collected. The study protocol was approved by the Charleston Area Medical Center Institutional Review Board in October 2016.
Results: 287 subjects were included in the analysis after 113 met exclusion criteria. Symptoms associated with Clostridium difficile infection did not differ between Clostridium difficile positive and negative groups. Disease severity from Clostridium difficile infection did not differ between initial glutamate dehydrogenase/enzyme immunoassay (GDH/EIA) positive and polymerase chain reaction (PCR) positive, p=0.207. Median time to antibiotic initiation was not delayed in Clostridium difficile positive PCR group compared to initial positive GDH/EIA group (13.8 hours versus 4.2 hours), p=0.105. Median length of stay did not differ between initial GDH/EIA negative and PCR negative (8.2 days versus 9.7 days, p=0.213) or between initial GDH/EIA positive and PCR positive (9 days versus 8.5 days, p=0.649) groups. Mortality did not differ between initial GDH/EIA negative and PCR negative (8.1 percent versus 6.3 percent, p=0.893) or between initial GDH/EIA positive and PCR positive (7.7 percent versus 5.9 percent, p=0.741) groups. Empiric therapy was initiated at similar rates for indeterminate GDH/EIA results and initial conclusive results (14.9 percent versus 9.4 percent), p=0.154. The mean duration of antibiotics did not differ between initial GDH/EIA negative (70.7 hours) and PCR negative groups (54.7 hours), p=0.495.

Conclusion: Delay in confirmatory polymerase chain reaction (PCR) results after indeterminate glutamate dehydrogenase/enzyme immunoassay (GDH/EIA) testing for Clostridium difficile infection did not significantly impact antibiotic utilization and mortality. Based on these results, empiric Clostridium difficile therapy should be considered while waiting for confirmatory PCR testing and adjusted according to the results.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-072

Poster Title: Impact of antimicrobial stewardship initiatives on vancomycin usage

Primary Author: Marsha Crader, University of Arkansas for Medical Sciences College of Pharmacy; Email: mfcrader@uams.edu

Purpose: The Centers for Disease Control and Prevention recommend seven core elements to be included in an inpatient antimicrobial stewardship program. As part of implementing the core elements, an antimicrobial stewardship committee tracked days of therapy for commonly prescribed antibiotics. The committee identified vancomycin as an antibiotic requiring specific intervention to improve its appropriate use. The goal of the committee was to determine if implemented initiatives would lead to a decrease in vancomycin usage.

Methods: Reduction of vancomycin usage was set as the inpatient antimicrobial stewardship program goal at a community hospital for fiscal year 2017. Multiple targeted initiatives were implemented to help facilitate the reduction of vancomycin usage. Interventions included utilization of clinical decision support to provide a 48-hour time-out for physicians followed by a 72-hour time-out for pharmacists on all active vancomycin orders. Negative methicillin-resistant Staphylococcus aureus (MRSA) nares screening was used to justify discontinuing vancomycin orders based on its value as negative predictor for MRSA pneumonia. Polymerase chain reaction (PCR) methodology was implemented by microbiology for blood cultures growing gram positive cocci on gram stain(s) to quickly determine whether or not a patient had MRSA. Education for healthcare providers was also implemented. To determine the impact of the initiatives on vancomycin use during the first 8 months of fiscal year 2017, vancomycin days of therapy (DOT) per 1000 patient days was retrospectively collected each month from October 2016 through May 2017. The same data was gathered and compared for fiscal year 2016 (October 2015 through May 2016) to evaluate the primary outcome of vancomycin usage. As a secondary outcome, linezolid and daptomycin DOT per 1000 patient days was collected for each month that vancomycin was reviewed to determine if other anti-MRSA antibiotics were used as an alternative to vancomycin. No patients were excluded from the retrospective review.

Results: Vancomycin DOT per 1000 patient days decreased from 63 in the first eight months of fiscal year 2016 to 53 during the same period of fiscal year 2017 (15.9 percent). During the same time frame, linezolid increased from 7 DOT per 1000 patient days to 8.5 (21.4 percent),

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
and daptomycin decreased from 4.5 DOT per 1000 patient days to 3 days (33 percent). Overall, a decrease of 74.5 to 64.5 DOT per 1000 patient days (13.4 percent) for anti-MRSA antibiotics was demonstrated.

**Conclusion:** Implementation of targeted initiatives in a community hospital to decrease vancomycin usage were successful and did not lead to an overall increase in the use of linezolid and daptomycin.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-073

Poster Title: Impact of antimicrobial stewardship interventions on the treatment of extended-spectrum beta-lactamase positive organisms

Primary Author: Marsha Crader, University of Arkansas for Medical Sciences College of Pharmacy; Email: mfcrader@uams.edu

Purpose: A community hospital identified a trend of increasing extended-spectrum beta-lactamase (ESBL) positive organisms through the annual antibiogram review. After further investigation of patients with an ESBL positive organism, the antimicrobial stewardship committee found an opportunity to improve empiric and targeted therapy of ESBLs within the institution.

Methods: Three key interventions were performed with the goal to improve treatment of possible or actual ESBL positive organisms. Microbiology interventions incorporated “ESBL positive” into the organism name and changed the culture and susceptibility (C and S) results to guide therapy decisions. Clinical decision support was utilized to alert pharmacists to review patients admitted with a history of an ESBL positive organism and patients with a current ESBL positive organism. Additionally, healthcare providers were educated. All emergency room, observation, and admitted patients with ESBL positive organisms were retrospectively reviewed 6 months prior to interventions (October 2015 through March 2016) and 6 months post interventions (June 2016 through November 2016). Exclusion criteria for empiric treatment included hospice admission, growth of a non-ESBL positive organism from the same source prior to admission, and the differential diagnosis excluding an ESBL positive infection (e.g., recurrent urinary tract infection). Exclusions for targeted treatment included the following: hospice admission, colonization determination, and C and S results reported post-discharge without documentation of final treatment. Patients were considered to have appropriate empiric therapy if an antibiotic was ordered within 24 hours of admission that was effective based on the most recent ESBL positive organism C and S results. Appropriate targeted therapy required an antibiotic order within 24 hours of the final C and S results, organism susceptibility, and appropriateness for site of infection.

Results: Prior to intervention, zero percent of the 10 patients with previous ESBL positive organisms were treated with appropriate empiric therapy upon subsequent admission. Following intervention, empiric therapy for possible ESBL positive infections was appropriate in...

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
17 out of 23 (74 percent) patient admissions. Pre-intervention, 16 of 19 (84 percent) ESBL positive organisms were identified and had correct targeted treatment. During the post-intervention period, 100 percent of the 42 ESBL positive organisms identified had appropriate targeted therapy.

**Conclusion:** Implementation of microbiology C and S result changes, pharmacists’ alerts, and healthcare provider education helped to improve empiric and targeted treatment of ESBL positive organisms.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-074

Poster Title: Delay in initiating prophylactic fluoroquinolones post autologous hematopoietic stem cell transplantation from Day 0 to neutropenia

Primary Author: Nicole Davis, The Mount Sinai Medical Center; Email: nicole.davis@mountsinai.org

Additional Author(s):
Kendra Yum
Amir Steinberg
Imelda De la Vega-Diaz
Sara Kim

Purpose: In patients who receive hematopoietic stem cell transplantation (HSCT), neutropenia occurs commonly within 5 to 7 days. To prevent bacterial infection, prophylactic antibiotics, most frequently fluoroquinolones, are administered. Determining the optimal time to begin antibiotic administration may minimize the risk of Clostridium difficile (C. difficile) infection as studies have identified it as a common complication in this population. This study evaluated the effect of a delay in fluoroquinolone prophylaxis after autologous HSCT on the rates of C. difficile infection and bacteremia.

Methods: A single-center retrospective, IRB approved, cohort study was performed in patients who received levofloxacin prophylaxis following autologous HSCT between November 2014 through April 2015 (day 0 initiation) and April 2016 through September 2016 (initiation after neutropenia). A bone marrow transplant data base was used to identify patients > 18 years of age who had an HSCT at our institution. Patients who received an allogeneic HSCT or had a C. difficile infection or bacteremia 14 days prior to HSCT were excluded. Electronic medical records were used for data collection. The data collected included demographic information, underlying malignancies, HSCT conditioning regimen, timing of initiation of levofloxacin prophylaxis post HSCT, use of acid suppressants, antibiotic use, and relevant laboratory data. The incidence of C. difficile infection and bacteremia in patients who initiated levofloxacin on day 0 was compared to those who started prophylaxis once the absolute neutrophil count (ANC) < 500 cells/µL.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: A total of 166 patients were identified for the study with 37 patients excluded based on exclusion criteria. Baseline characteristics were similar between groups. Compared to the day 0 group, patients who initiated prophylaxis once ANC < 500 cells/µL had a reduction in rates of C. difficile (0% vs. 7.9%, P=0.03). In addition, no difference was shown in the rates of bacteremia (4.5% vs. 7.9%, P=0.49). All patients received acid suppression therapy and the number of patients who received additional antibiotics was similar as well (61.9% vs. 51.5%, P=0.24).

Conclusion: Delaying initiation of levofloxacin until neutropenia in post-autologous HSCT can potentially reduce the incidence of C. difficile without increasing the risk of bacteremia.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-075

Poster Title: Clinical impact of discordant empiric antimicrobial selection for inpatient treatment of pyelonephritis at two metro area hospitals

Primary Author: Carmen Frerichs, Bryan Health; Email: carmen.frerichs@gmail.com

Additional Author(s):
Christopher Destache
Jennifer Anthone

Purpose: The Infectious Diseases Society of America (IDSA) guidelines suggest that appropriate empiric therapy for complicated urinary tract infections (UTI) include either fluoroquinolones or extended-spectrum cephalosporins, among others. These evidence-based guidelines also suggest that if local resistance rates to fluoroquinolones exceed 10 percent, empiric therapy with an alternative agent should be considered. This study aimed to determine local antimicrobial resistance rates and how empiric selection of discordant antimicrobial therapy affected outcomes in hospitalized patients with pyelonephritis.

Methods: This study was a retrospective electronic health record (EHR) review approved by the Institutional Review Board. Non-pregnant patients 19 years and older with a diagnosis of pyelonephritis as determined by International Classification of Diseases (ICD)-10 codes and confirmed via review of the EHR from October 1, 2015 through September 30, 2016 were included. Diagnosis of pyelonephritis was confirmed with a urine culture containing at least 100,000 colony forming units per milliliter of a gram-negative pathogen in the presence of symptomatology consistent with pyelonephritis, including a temperature greater than or equal to 38.0 degrees Celsius, or the presence of “flank pain” or “costovertebral tenderness” as recorded in the EHR. Data collection included patient demographics, comorbidities, urine cultures and sensitivities, and empiric antimicrobial selection. Discordant antimicrobial selection was defined as empiric therapy to which the identified organism was resistant. The primary objective of this study was to compare patient outcomes in those receiving discordant empiric therapy versus those receiving concordant empiric therapy. Patient outcomes included length of hospitalization and time to clinical resolution of infection (fever and white blood cell count). Descriptive statistics were used on all discrete variables, student t-test was used for continuous variables, and logistic regression was used to identify risk factors associated with antimicrobial resistance.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: A total of 195 patients were identified with pyelonephritis based on ICD-10 codes. Of those patients, 138 were excluded and 57 were included in the final analysis (concordant equals 53, discordant equals 4). Distribution of urinary isolates reflected national data with 83 percent identified as Escherichia coli. Approximately half of the patients were treated empirically with ceftriaxone. There was no statistically significant difference in demographics between groups or in mean length of stay (concordant was 3.5 days, discordant was 5.0 days). There was a statistically significant difference in time to resolution of fever between the two groups (concordant was 23.0 hours, discordant was 53.3 hours, p equals 0.032). Finally, time to ten percent decrease in white blood cell count was virtually identical between the two groups. In a subset analysis, when comparing patients with fluoroquinolone resistant isolates to those with fluoroquinolone susceptible isolates, patients that had received intravenous antibiotics within the preceding three months (p less than 0.001), those that resided in a skilled nursing facility prior to admit (p less than 0.001), and those patients with diabetes mellitus (p equals 0.002) were more likely to be infected with fluoroquinolone-resistant isolates. No characteristics were identified as associated with cephalosporin resistance.

Conclusion: In this retrospective analysis, discordant antimicrobial therapy was associated with an increased time to resolution of fever and showed a trend toward longer hospital length of stay in hospitalized patients with pyelonephritis. The study was limited by the small sample size, the large difference in size between groups, and its retrospective nature. Despite this, characteristics associated more frequently with fluoroquinolone resistance were identified and will be used to help educate providers and guide future prescribing habits.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-076

Poster Title: Interprofessional approach to reducing hospital-onset Clostridium difficile infections

Primary Author: Paul Green, CompleteRx / Upper Allegheny Health System; Email: dr.paul.green@gmail.com

Additional Author(s):
Ashley Halloran
Julie Kenyon
Victoria Nosowicz

Purpose: In 2011, Clostridium difficile caused approximately 453,000 infections nationally, and 29,000 of those patients died within 30 days of the initial diagnosis. Roughly two-thirds of the infections were associated with a hospitalization. Numerous factors have led to a rise in hospital-onset Clostridium difficile infection cases despite a decline in overall healthcare-associated infections. Historically, our healthcare system struggled to maintain a hospital-onset Clostridium difficile infection rate below the national benchmark of 11.3 cases per 10,000 patient days. A serious increase to a peak of 19.4 cases per 10,000 patient days led to a call to action by the healthcare system’s administration.

Methods: An interprofessional workgroup was established in partnership with the healthcare system’s antimicrobial stewardship program with the goal of improving the hospital-onset Clostridium difficile infection rate. This workgroup identified several significant areas of opportunity including environmental cleaning practices, misuse of antimicrobials, and clinical care of patients with Clostridium difficile. Initial efforts implemented include updated computerized provider order entry order sets for many common infections, a reserved medications list to protect the use of broad-spectrum antimicrobials, a five-day automatic stop for antimicrobials including a time-out process, improved terminal cleaning for rooms and areas which have had a Clostridium difficile-positive patient, the implementation of ultraviolet light robots used for disinfection in various high-risk areas including Clostridium difficile patient rooms, development of antimicrobial tracking reports to monitor the utilization of targeted medications as well as potential treatment and susceptibility mismatches, increased communication to all levels of staff throughout the healthcare system via various routes, improved isolation and personal protection practices including increased monitoring of

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
handwashing practices and utilization of personal protective equipment, and multidisciplinary engagement throughout the hospital together with a formal statement of support from administration. In addition, policies were developed and updated to address therapeutic interchanges, intravenous to enteral transitions, renal and pharmacokinetic dosing, and antimicrobial streamlining. Education related to these wide-ranging initiatives was also provided throughout the healthcare system in various forums.

**Results:** After years of having a highly volatile hospital-onset *Clostridium difficile* infection rate and a peak quarterly average of 19.4 cases per 10,000 patient days in the third quarter of 2015, the interprofessional workgroup showed great success in its first year. Since the implementation of the workgroup in the fourth quarter of 2015, the hospital-onset *Clostridium difficile* infection rate has remained well below the national benchmark each quarter with a mean of 8.1 cases per 10,000 patient days and a low of 4.6 cases per 10,000 patient days occurring in the third quarter of 2016. This vast improvement coincides with decreased utilization of several targeted antimicrobial agents particularly those considered to be broad-spectrum or highly correlated with *Clostridium difficile* infections.

**Conclusion:** While our interprofessional efforts are still in their infancy compared to those at many large tertiary centers, we are already showing promising results with respect to our hospital-onset *Clostridium difficile* infection rate. Our study demonstrates that success can be achieved even in a small rural hospital setting with minimal infectious disease provider involvement. The data on which we have reported here reflect only a glimpse of the possible other improvements that can be made in the other aspects of antimicrobial stewardship.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-077

**Poster Title:** Impact of system-wide implementation of antimicrobial stewardship program on total systemic antifungal use in the largest not-for-profit health system in the United States

**Primary Author:** Roy Guharoy, Ascension health; **Email:** Roy.guharoy@ascension.org

**Additional Author (s):**
Mohammed Abdulwahhab  
Florian Darajati  
Danielle Sebastian  
Mohamad Fakh

**Purpose:** Antimicrobial stewardship (AS) plays the most crucial role to control the development of multidrug resistant organisms (MDROs) and the integrated strategic approach allows health systems to improve antimicrobial use with the goal of enhancing patient outcomes, reducing resistance and decreasing costs. In recognition of the urgent critical need, we established a Center of Excellence for Antimicrobial Stewardship and Infection Prevention for system-wide implementation of AS practices and standardization of care. We describe the impact of AS programs on antifungal use compared against previous year.

**Methods:** Each hospital developed physician-pharmacist led AS teams to ensure evidence based antimicrobial use, culture orders and standardized disease management process. Evidence based usage criteria for systemic antifungal agents were developed. In addition, defined daily dose/1000 patient days (DDD/1000 pt. days) were tracked and shared with each facility each month to identify successes, opportunities and develop plan of action.

**Results:** Defined daily dose (DDD) per 1000 patient days of all systemic antifungal agents decreased from 33.36 in FY 16 to 31.25 (6.3% decrease). DDD/1000 patient days increased from 1.21 in FY 16 to 1.22 in FY 17. Echinocandin and azole use decreased from 4.87 and 26.81 to 4.82 and 24.56 respectively. Oral antifungal use decreased from 17.4 to 16.6 in FY 17. IV use decreased from 15.96 to 14.6. Fluconazole was most commonly used agent. Oral fluconazole use decreased from 14.44 to 13.6 DDD/1000 patient days in FY 17. IV use decreased from 9.25 to 7.98 during the same period.

---

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Conclusion:** A system-wide standardized antimicrobial stewardship strategy results in the reduction of inappropriate antifungal use across the health system.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-078

Poster Title: Impact of system-wide implementation of antimicrobial stewardship on antibiotic utilization at 22 critical access hospitals

Primary Author: Roy Guharoy, Ascension health; Email: Roy.guharoy@ascension.org

Additional Author (s):
Nisha Bhide
Florian daragjati
Danielle Sebastian
Mohamad Fakah

Purpose: Antimicrobial stewardship is essential to curb the development of multidrug resistant organisms. Source-directed therapy, followed by prospective monitoring and interventions based on clinical changes and microbiologic findings are the keys to the success. We describe the impact of system-wide implementation of antimicrobial stewardship (AS) at 22 critical hospitals.

Methods: Each hospital developed physician-pharmacist led AS teams to ensure evidence based antimicrobial use, culture orders and standardized disease management process. Evidence based indicators were developed for targeted agents. In addition, defined daily dose/1000 patient days (DDD/1000 pt. days) were tracked and shared with each facility each month to identify successes, opportunities and develop plan of action.

Results: Total systemic antibiotic use dropped (defined daily dose/1000 patient days) from 1735 in FY 15 to 1256 in FY 16 to 1158 in FY 17 (33% decrease). Daptomycin use decreased from 27.8 DDD/1000 patient days in FY 15 to 14.7 in FY 16 and 6.69 in FY 17. Ertapenem use decreased from 20.85 in FY 15 to 13.35 in FY 16 and 4.47 in FY 17. Tigecycline use decreased from 1.81 to 1.49 and 0.057 during the same period.

Conclusion: A system-wide standardized antimicrobial stewardship strategy resulted in the reduction of inappropriate antibiotic use in our 22 critical access hospitals.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-079

Poster Title: Increasing antimicrobial stewardship services in small and rural hospitals through an antimicrobial stewardship alliance

Primary Author: Oscar Guzman, Cardinal Health; Email: oscar.guzman@cardinalhealth.com

Additional Author (s):
Kate Shea
Jennifer VanCura

Purpose: In 2016, the Center for Medicare and Medicaid Services (CMS) released a proposed rule that included provisions incorporating antibiotic stewardship activities for hospitals and critical access hospitals (CAH). In January 2017, the Joint Commission (TJC) approved a new antimicrobial stewardship medication management standard (MM.09.01.01) for hospitals and CAHs. In December 2016, a Small and Rural Hospital Antimicrobial Stewardship Alliance (SARAA) was established with the purpose of providing expert antimicrobial stewardship program (ASP) consultation and resources to 24 US hospitals. Investigators sought to assess compliance with TJC and proposed CMS standards with a plan to implement and enhance existing programs.

Methods: This was a multi-site survey assessing compliance with 20 regulatory elements for hospital and CAH ASPs. Using a basic Likert scale [0=not present, 1=present, 2=partial], antimicrobial stewardship activities (as outlined by TJC and proposed CMS standards) were assessed for individual hospitals and the entire cohort.

Results: Twenty-four hospitals and critical access hospitals (average daily census = 14) completed the survey. No hospital was 100% compliant with the twenty regulatory elements, 37% (± 17%) and 19% (± 12%) of participants answered present or partial to all elements, respectively. Only 2 questions had greater than 50% “present” response. These two elements included; coordination with infection prevention, quality, medicine, nursing, and pharmacy on antibiotic use issues and the presence a pharmacist leader. The top five needs (as identified by more than 75% of hospitals replying “not present”) included; competency based education of hospital personnel, ASP documents evidence-based use of antibiotics, hospital collects, analyzes, and reports data on ASP, ASP demonstrates improvements in proper antibiotic use, and the hospital take action on improvement opportunities identified by the ASP.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Conclusion: This standardized survey identified gaps in practice and recognized a critical need for antimicrobial stewardship support within the small and rural hospitals in our cohort. Next steps to further the programs include a phased approach to achieve regulatory compliance within all 24 hospitals with special focus on mandatory stewardship components.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-080

Poster Title: Impact of an ertapenem therapeutic interchange in a community hospital

Primary Author: Matthew Hamilton, Cardinal Health; Email: matthew.hamilton@cardinalhealth.com

Additional Author(s):
Kate Shea
Oscar Guzman
Leo Sokolskiy

Purpose: In 2013, the Centers for Disease Control reported carbapenem-resistant Enterobacteriaceae (CRE) as an urgent antibiotic resistance threat. Carbapenem utilization has been shown to significantly increase the risk of CRE. Guidelines recommend restriction as an effective strategy for antimicrobial stewardship. Investigators sought to assess the impact of an ertapenem restriction and therapeutic interchange program on consumption and acquisition costs.

Methods: This was a single center, retrospective study comparing consumption before (November 2015-October 2016) and after (November 2016-April 2017) implementation of an ertapenem restriction and therapeutic interchange program. Prior to November 2016, ertapenem was non-restricted. A therapeutic interchange was approved by the Pharmacy and Therapeutics Committee in August of 2016 and implemented at the end of October 2016. Post-implementation of the interchange prescribers ordering ertapenem within the computerized physician order entry system were directed to select either ceftriaxone plus metronidazole or meropenem if an extended-spectrum beta-lactamase producing organism was suspected. Consumption as defined by cost per acute patient day (cost/APD) and acquisition cost were assessed pre- and post-implementation for carbapenems, ceftriaxone, and metronidazole.

Results: The hospital experienced a significant reduction in mean (+ SD) ertapenem cost/APD post implementation [(0.98 + 1.11) vs. (0 + 0); p=0.025]. A corresponding non-significant trending increase in meropenem [(1.41 + 0.89) vs. (1.57 + 0.29); p=0.337] and ceftriaxone [(1.30 + 2.29) vs. (2.60 + 0.83); p=0.101] was demonstrated. No difference was observed in average total acquisition cost per month for carbapenems ($4,409.69 vs. $4,231.27; p=0.425).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Conclusion: Implementation of a therapeutic interchange from ertapenem to ceftriaxone plus metronidazole or meropenem was an effective strategy for reducing ertapenem consumption without significantly impacting meropenem or ceftriaxone.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-081

Poster Title: Impact of a 72 hour time out on duration of intravenous antibiotic therapy

Primary Author: Kori Hamman, The Mount Sinai Hospital; Email: kori.hamman@mountsinai.org

Additional Author(s):
Patricia Saunders-Hao
Gargi Patel
Polina Lerner
Meenakshi Rana

Purpose: Antimicrobial stewardship has reached a critical turning point in addressing antibiotic resistance. The CDC recommends that hospitals adopt an antibiotic “time out” as a core element in antibiotic stewardship programs. In January 2017, The Mount Sinai Hospital implemented a new “time out” notification alerting physicians through the computerized physician order entry (CPOE) system after 72 hours of antibiotic therapy. This alert requests reassessment of the utility of the antibiotic. The objective of this study was to determine the impact of this 72 hour “time out” on the overall length of IV antibiotic therapy.

Methods: A retrospective review of medication administration records was performed between October 2016 and April 2017. All patients with ≥ 1 day of standing IV antibiotic therapy were included. An electronic “time out” alerts prescribers in our electronic medical record system after 72 hours (beginning of day 4), and on days 5, 6 and 7 of therapy. This new alert requests reassessment of the utility of the antibiotic. Data was collected 3 months prior and 3 months post implementation of the “time out”. This data was used to assess antibiotic discontinuation on day 4, day 5-7 and orders renewed beyond day 7, and whether there was a significant difference after the alert was put into place. Data collected included medication name, dose, order start and end date, and total duration of therapy.

Results: A total of 11,902 orders lasting for > 1 days were analyzed pre-implementation and 10,694 analyzed post- implementation. There was no difference found in orders ending on day 4 pre- and post-implementation (769 (34%) vs. 664 (33.3%) respectively, P < 0.52). There was however, a significant difference in orders ending on days 5-7 (1101 (48.7%) pre-implementation vs. 1019 (51.1%) post-implementation, P < 0.03). There was also a trend towards significance in orders renewed beyond 7 days (390 (17.2%) vs. 310 (15.6%), P < 0.05).
Conclusion: The authors concluded that the “time out” alert after had a meaningful impact on duration of antibiotic therapy. It was expected that there would be no difference in orders ending on day 4 due to the likelihood of unclear microbiology data. We conclude from the significant difference in orders ending of days 5-7 that the “time out” caused physicians the assess therapy earlier and formulate a plan. We also conclude from the trend towards significance in orders renewed beyond 7 days that this “time out” has the potential to impact side effects, costs and antibiotic resistance in a positive manner.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-082

Poster Title: Implementation and evaluation of a vancomycin dosing per pharmacy protocol in a large academic medical center

Primary Author: Shaydul Hassan, Mount Sinai Hospital; Email: shaydul.hassan@mountsinai.org

Additional Author (s):
Patricia Saunders-Hao
Gargi Patel
Gina Caliendo
Joanne Meyer

Purpose: The primary objective of this study is to gain an understanding of the efficacy of vancomycin dosing per pharmacy based on outcomes in the pilot units. The goal is to expand the service to other inpatient units and ultimately implement a hospital-wide vancomycin dosing per pharmacy protocol.

Methods: A medication use evaluation was conducted to assess physician based vancomycin dosing and revealed improper dosing and monitoring. This led to the conception of the vancomycin per pharmacy protocol. The vancomycin per pharmacy program was initiated in two inpatient oncology units in 2013 and was now expanded to an additional unit, vascular surgery. Education was provided to physicians, nurse practitioners, and pharmacists through the use of previously developed in-service materials. All patients receiving at least one dose of vancomycin were included in the data. The data collection parameters are patient age, weight, gender, serum creatinine and calculated creatinine clearance, treatment dose and time, vancomycin levels and time the level was drawn. Data collection dates range from March 2016 to February 2017. The two treatment groups are allocated as dosing per pharmacy and traditional dosing. Traditional dosing is based on a physician-managed treatment approach as opposed to the pharmacist-managed per pharmacy protocol. The outcomes are the percentage of patients receiving correct initial doses, frequency, timing of levels, the percentage of patients with levels obtained who were on therapy for five days or more, and the percentage of patients achieving therapeutic range.

Results: A total of 180 patients were enrolled in vancomycin per pharmacy service in two inpatient oncology units from September 2013 through March 2017 and 26 patients in a
vascular surgery unit from November 2016 to March 2017. A total of 233 vancomycin levels were obtained in that time frame. When comparing to the prior physician-managed MUE, there was a trend toward improvement in correct initial dosing and frequency, and an increase in monitoring and obtaining of therapeutic trough goal range. Out of 154 total levels drawn correctly within one hour prior to steady state dose, there were 41 (26.6%) subtherapeutic levels, 24 (15.6%) supratherapeutic levels, and 67 (43.5) levels within trough goal range based on indication. Ninety-seven (63.0%) levels were within the range of 10-20 mg/L, while 107 (69.5%) levels were within the range of 8-22 mg/L.

**Conclusion:** Additional data is needed to determine overall efficacy, though it is anticipated that a trend towards improved therapy with pharmacist-managed vancomycin dosing will be seen. Prospective evaluation will continue until the efficacy of vancomycin dosing per pharmacy is determined with the overall goal of expanding the service hospital-wide.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-083

Poster Title: Dynamics and characterization of direct acting antivirals (DAA) treatment induced serum AFP reduction in HCV-infected patients without hepatocellular carcinoma

Primary Author: Tung Huynh, University of California Irvine Medical Center; Email: tungh@uci.edu

Additional Author(s):
Johnathan Zhang
Mohit Mittal
Ke-Qin Hu

Purpose: Elevated serum AFP has been reported during HCV treatment, especially HCV-Cirrhosis. It was recently reported that Direct-Acting Antivirals treatment (DAA Rx) may result in reduction of elevated serum AFP, but larger and more detailed studies are needed to characterize how DAA Rx impacts elevated AFP in HCV-infected patients. This study assessed the frequency of baseline AFP elevations and their related factors, dynamic changes of AFP during and after DAA Rx, and factors associated with AFP reduction.

Methods: This is a retrospective chart review with data collection and analysis on 149 HCV-infected patients without HCC, finished a full course of DAA Rx and minimum 12 weeks post Rx follow-up (PRx F/U). DAA treatment regimens included SOF/LDV (85, 57%), SOF/RBV (19, 13%), SOF/SMV (16, 11%), ELB/GRZ (11, 7%), 3D (6, 4%), SOF/VEL (4, 3%), other (8, 5%). Statistical Package for the Social Sciences (SPSS) program was used for statistical analysis. 141 had SVR12 and 8 relapsed; 4 patients were diagnosed for Hepatocellular Carcinoma (HCC) during PRx F/U. Additionally, 3 cases with baseline HCV-cirrhosis, HCC, and elevated AFP were used for comparison.

Results: Mean PRx F/U 54 (12-124) weeks; mean age, 57.8 (20-85); 51%, males; 78% GT-1; 47%, cirrhosis. 56.9% had baseline AFP elevation (> 5.5 ng/mL); 30%, > 10; 8.5% > 25; and 4.7%, > 50. Baseline AFP > 5.5 was associated with histologic G3-4 (p=0.016), F3-4 (p=0.008), NASH (p=0.018), cirrhosis (p < 0.001), and end of follow-up (EOF) ALT < 30 IU/L (p=0.026). On multivariate analysis, baseline AFP > 5.5 was associated with NASH (p=0.035), cirrhosis (p < 0.001), and GT1 (p=0.029). AFP normalization was seen in 0%, RxW2; 19.0%, RxW4; 32.7%, end of treatment (EOT); 39.4%, PRxW12; 52.9%, PRxW24; 56.7%, PRxW48; and 57.1%, EOF.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Univariate analysis showed PRxW24 AFP normalization was associated with absence of cirrhosis (p=0.005), CPC < 6 (p=0.024), baseline AFP < 10 (p < 0.001) and ALT/AST < 40 IU/L (p=0.029), and RxW4 AST < 30 (p=0.008). Multivariate analysis showed PRxW24 AFP normalization was associated with absence of cirrhosis (p=0.003), CPC < 6 (p=0.015), baseline AFP < 10 (p=0.015). During PRx F/U, 4 developed HCC. All had baseline cirrhosis and AFP elevation, none had AFP normalization at HCC diagnosis. 3 cases with HCV-cirrhosis, uncontrolled HCC, and baseline elevated AFP had continual AFP rise during Rx and PRx F/U.

**Conclusion:** Baseline AFP elevation occurred in 56.9% of cases undergoing DAA Rx and is independently associated with NASH, cirrhosis, and GT1 infection. DAA Rx resulted in AFP normalization as early as RxW4 with progressive reduction through PRxW48, and by the EOF, 57.1% had AFP normalization. PRxW24 AFP normalization is independently associated with absence of cirrhosis, CPC < 6, and baseline AFP < 10.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-084

Poster Title: Comparison of narrow versus broad spectrum antibiotics in elderly patients with acute exacerbations of chronic obstructive pulmonary disease

Primary Author: Kayla Joyner, University Hospitals Geauga Medical Center; Email: kjoyner@neomedi.edu

Additional Author(s):
Mate Soric

Purpose: Little guidance is provided regarding the selection of antibiotic therapy for acute exacerbations of chronic obstructive pulmonary disease (AECOPD). Clinical opinion, epidemiological studies, and post-hoc analysis of a major clinical trial supports utilizing a risk stratification approach when selecting antibiotics. Data suggests broad spectrum antibiotics in four groups of patients at higher risk for poor outcomes, including the elderly (age >65 years). The purpose of this study is to compare outcomes of elderly patients receiving broad versus narrow spectrum antibiotics during a hospitalization for AECOPD.

Methods: A retrospective observational study was performed using electronic medical records of patients >65 years old admitted with a primary diagnosis of AECOPD or a primary diagnosis of acute respiratory failure and a secondary diagnosis of AECOPD. The primary outcome was a composite of mechanical ventilation within 48 hours of admission, transfer to intensive care status after 48 hours of admission, readmission within 30 days for COPD exacerbation, and oxygen saturation less than 90% on room air or increased oxygen requirements from baseline after 48 hours. Secondary outcomes included individual components of the primary outcome, hospital length of stay, 10-day and 90-day readmission for AECOPD, all-cause 30-day and 90-day readmission, and clinical decompensation after 48 hours based on systolic blood pressure, respiratory rate, heart rate, oxygen saturation, and increased supplementary oxygen needs. Data collected and analyzed includes patient baseline demographics, risk factors for multidrug resistant bacteria, home medications, concomitant hospital treatments, and antibiotics used.

Results: An interim analysis of 150 patients was completed with 61 patients in the narrow spectrum group and 89 patients in the broad spectrum group. Incidence of the primary composite outcome occurred in 32 (52.5%) and 51 (57.3%) of patients in the narrow and broad spectrum groups, respectively (p=0.56). Among secondary outcomes, no difference was found
in geometric mean length of stay (p=0.75). No difference was found in 30-day readmission with 19.7% in the narrow spectrum group and 20.2% of patients in the broad spectrum group (p=0.93).

**Conclusion:** The interim analysis of this retrospective underpowered study found no difference in outcomes in patients with AECOPD. Continued data collection is underway.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-085

Poster Title: Risk factors for nephrotoxicity in elderly critically ill patients receiving intravenous doses of colistin

Primary Author: SungEun Kim, Seoul National University Hospital; Email: eun1610@gmail.com

Additional Author(s):
Yun Hee Jo
Hyeon Joo Hahn
Yoonsook Cho
A Jeong Kim

Purpose: Colistin is an antimicrobial agent used to treat multidrug-resistant Gram-negative infections. The high rate of nephrotoxicity has been reported in patients treated with colistin. Elderly critically ill patients are potentially vulnerable to the development of adverse drug reaction. The aim of this study was to evaluate incidence and risk factors associated with development of nephrotoxicity in elderly critically ill patients receiving intravenous (IV) colistin.

Methods: A retrospective study was performed over 42 months in 45 elderly (≥ 65 years of age) patients who had been treated with IV colistin ≥ 3 days in medical intensive care unit and had baseline creatinine (Cr) < 1.3 mg/dL. Renal function was assessed on Day 7 and at the end of treatment (EOT). Severity of nephrotoxicity was defined by the RIFE criteria with serum Cr level.

Results: Twenty (44%) and twenty-nine (64%) patients developed nephrotoxicity on Day 7 and EOT, respectively. Patients who experienced nephrotoxicity were in the Risk (25%), Injury (25%), or Failure (50%) categories on Day 7 and in the Risk (28%), Injury (34%), or Failure (38%) categories on EOT. The logistic regression model showed that development of nephrotoxicity at EOT associated with baseline urinary output < 1.4 mL/kg/hr and concomitant use of vasopressor.

Conclusion: In elderly critically ill patients administered IV colistin, nephrotoxicity occurred at a high rate. Elderly patients especially who use vasopressor and have low baseline urinary output should be closely monitored when receiving IV colistin.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-086

**Poster Title:** Antimicrobial utilization reduction through the installation of four stewardship programs

**Primary Author:** Davey Legendre, Comprehensive Pharmacy Services; **Email:** daveymunx@yahoo.com

**Purpose:** Antimicrobial stewardship is a critical program to preserve the efficacy of antimicrobials. The main goal of stewardship programs is to improve patient outcomes by reducing unnecessary antimicrobial use. However, there is some controversy about which strategies are best to achieve significant reductions. The purpose of this study was to evaluate the impact of four stewardship strategies in hospitals with relatively higher utilization of antimicrobials.

**Methods:** Using a database of 180 hospitals in the United States, 44 hospitals were more than two standard deviations above the mean in consumption of antimicrobials (units) per patient day. Hospital size ranged from critical access to large, academic medical centers. A time series matched cohort investigation was conducted to assess the impact of implementing four antimicrobial stewardship strategies. The strategies included creating a multidisciplinary team with a pharmacist member, identifying and reporting meaningful metrics, conducting healthcare-practitioner educational programming, and publishing an antibiogram. Antimicrobial utilization during the baseline period of 12 months in 2014 was compared to the post-implementation period of 12 months in 2015/2016 in units per patient day. A paired t-test was used to ascertain statistical significance between the two periods. To analyze each component of the program, a two-sample equal variance t-test was used with data from the post-implementation period, comparing overall antimicrobial consumption.

**Results:** In the baseline period across the 45 hospitals, antimicrobial utilization was 14.11 units per patient day. In the post-implementation period, antimicrobial utilization was 12.26 units per patient day, representing a 13.1 percent reduction and resulting in savings of $2,373,603. This reduction was statistically significant per t-test (p=0.003). Three of the four strategies alone were statistically associated with lower antimicrobial utilization, including multidisciplinary team (p=0.001), reporting metrics (p=0.020), and educational programming (p=0.031).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Conclusion: The implementation of four stewardship strategies significantly reduced antimicrobial utilization, a key goal of any antimicrobial stewardship program. Hospitals in the United States benefit from implementing these four antimicrobials stewardship strategies. Three of four single strategies were shown to be effective, but multiple strategies in concert provided the most reduction in utilization.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-087

Poster Title: Effectiveness and safety of intravenous fosfomycin at doses of 12-24 g/day in adult patients: a review of the literature

Primary Author: Thomas Lodise, Albany College of Pharmacy and Health Sciences; Email: thomas.lodise@acphs.edu

Additional Author (s):
Nimish Patel
Kim Sweeney
Paul Eckburg

Purpose: Fosfomycin (FOS) is a first-in-class, epoxide antibiotic with broad in vitro activity against many multidrug-resistant Gram-negative and Gram-positive pathogens, including extended-spectrum beta-lactamase, carbapenem-resistant Enterobacteriaceae, and multidrug resistant Pseudomonas aeruginosa. FOS is available in oral and IV formulations, although the bioavailability of the oral form limits its use for serious systemic infections. IV FOS is currently approved in Europe for a variety of indications and doses, and is being assessed in a Phase 3 study of complicated urinary tract infection (cUTI) (FOS 6 g IV every 8 hours) for USA registration.

Methods: This investigation summarizes the clinical and safety findings from published clinical trials that studied FOS IV at high doses ranging from 12-24 g/day. A comprehensive literature search of clinical trials with FOS daily doses of 12-24 g/day was conducted using the United States National Library of Medicine (PubMed), ClinicalTrials.gov and Google Scholar databases. Articles that were published between and inclusive of 1960 and 2017 were included. Search terms included ‘fosfomycin’ or the additional derivations or analogs to fosfomycin (‘phosphomycin’, ‘phosphonomycin’, ‘ZTI-01’) along with terms ‘intravenous’ and ‘clinical’ or ‘human’. Review articles and meta-analyses were hand searched for additional original articles of relevance. Conference proceedings were included if abstracts/posters/oral presentations could be obtained. Abstracts published in English language were reviewed for relevance. Relevant articles published in another language were translated to English if time permitted.

Results: A total of 34,299 patients in 47 trials have received high doses of IV FOS for up to 6 weeks of therapy. Of these patients, 31,873 received 9 to 21 g/day in one study (Kawabata

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Japan J Chemo 2000; 48(11):851-74; the other 46 studies had a total of 2,426 patients who received 12-24 g/day. These trials included patients with bone & joint, cardiovascular, central nervous system, cystic fibrosis-associated pulmonary, diabetic foot, hepatobiliary, bloodstream/sepsis, pulmonary, skin and soft tissue, cUTI and urogenital infections. The endpoints varied across studies and included mortality, clinical response (various definitions), and microbiologic response/eradication. Overall, efficacy data were positive, suggesting that FOS IV 12-24 g/day was associated with similar or better outcomes relative to comparators. Reported adverse events were generally infrequent and mild in nature. Among studies that documented adverse events, those leading to treatment discontinuation were uncommon. In few studies, hypokalemia was reported to occur in >5% of patients.

**Conclusion:** This evaluation shows the breadth of clinical experience of high-dose IV FOS across a wide variety of indications and patient populations supporting IV FOS clinical utility and tolerability.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-088

Poster Title: Fluoroquinolones use among Lebanese patients: a drug utilization study

Primary Author: Elise Makhoul, Lebanese Canadian Hospital; Email: elise.makhoul@gmail.com

Additional Author(s):
George Aoun
Fouad Sakr
Mariam Dabbous
Zeina Farah

Purpose: The use of fluoroquinolones is increasing in the Lebanese community. Lately, the food and drug administration (FDA) published a warning that reserves the use of fluoroquinolones only when there is no other treatment options in acute bacterial sinusitis, acute bacterial exacerbation of chronic bronchitis, and uncomplicated urinary tract infections, due to their serious adverse events as peripheral neuropathy, tendinitis, and tendon rupture. The purpose of this study is to assess the utilization of fluoroquinolones in accordance to this international warning.

Methods: This prospective study was approved by the institutional review board. It was conducted in twenty three community pharmacies in Mount Lebanon over a period of 6 months. Pharmacies were selected based on cluster randomization. Patients aged 18 years and above, who were prescribed any brand of an oral fluoroquinolone, were included. A structured survey with closed-ended questions was used to investigate the indication, dose, and duration of treatment, as well as antibiotics allergy, and antibiotics use within the past 3 months. The primary outcome was to assess fluoroquinolones indication in accordance to the late FDA warning. The secondary outcome was to assess the frequency of prescribed fluoroquinolones in each of the indications concerned in the warning. Data are expressed as frequencies and evaluation of outcomes utilized analysis of chi-square.

Results: 350 patients were enrolled in the study as they were prescribed a fluoroquinolone. Among those, 169 patients were prescribed a fluoroquinolone for one of the indications concerned in the FDA warning. Most of these patients weren’t adherent to the FDA recommendation. 69.6 percent of the 169 patients were prescribed a fluoroquinolone as a first line therapy versus 30.4 percent who were initially prescribed another class of antibiotics

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
according to the corresponding guidelines. For the secondary outcome measure, 13.1 percent took fluoroquinolones for uncomplicated urinary tract infection, 9.7 percent took it for acute bacterial sinusitis, and 2.9 percent took it for acute bacterial exacerbation of chronic bronchitis.

**Conclusion:** Non-adequate adherence to the FDA warning and recommendation regarding fluoroquinolones utilization was found in the Lebanese community. Therefore, pharmacists should work with other clinicians to have a more strict prescribing pattern of fluoroquinolones in order to optimize patient care. As well, community pharmacists should educate their patients further about possible adverse events of fluoroquinolones and associated alarming signs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-089

Poster Title: Effectiveness of direct-acting antivirals in transplant recipients with hepatitis C virus at an urban academic medical center: a single-center retrospective review

Primary Author: Michelle Martin, University of Illinois Hospital and Health Sciences System / University of Illinois at Chicago College of Pharmacy; Email: mmichell@uic.edu

Additional Author(s):
Darby Rosenfeld
Grace Go
Todd Lee

Purpose: Clinical trials have evaluated sustained virologic response (SVR) rates after hepatitis C virus (HCV) treatment with some direct-acting antiviral (DAA) regimens in post-liver transplant patients, but do not address all regimens and other solid-organ transplant recipients. Real-world data provides information on the effectiveness of other DAA regimens and in other solid-organ transplant recipients.

Methods: Investigators performed a retrospective review of the electronic medical records of post-transplant recipients who started HCV treatment at an urban academic medical center from January 1, 2014 to December 1, 2016. Data collection included baseline characteristics, including age, gender, ethnicity, body mass index (BMI), stage of disease, concurrent medications, type of transplant, time from transplant, comorbidities HCV treatment history, regimen, and labs. The data from patient charts with SVR results available were analyzed using descriptive statistics, Fisher’s exact test, and Pearson’s chi-square test. The primary endpoint was the number of transplant recipients who reached SVR with each regimen. The secondary endpoints were SVR rates by patient characteristics. This research was approved by the institutional review board.

Results: Of the 98 post-transplant recipients who started HCV treatment, SVR data were available for 86; 58 liver, 17 kidney, 7 liver and kidney, and 4 pancreas and kidney. Patients had a mean age of 59.9 years, BMI of 27.9; 76-percent were male, 41-percent African American, 10-percent on dialysis, 40-percent cirrhotic, 58-percent treatment-naïve, and 92-percent had genotype (GT) 1, 49-percent diabetes, and 14-percent hepatocellular carcinoma (HCC). Nineteen percent of patients were treated within a year after transplant; 85-percent were
taking tacrolimus for immunosuppression, and 30-percent required dose changes in immunosuppression during HCV treatment. Forty-eight percent received ribavirin; 71-percent of whom experienced anemia. The overall SVR rate was 91-percent (78/86); it was 92-percent (73/79) for GT 1 patients. SVR percentage rates were 100 (8/8) for elbasvir/grazoprevir with or without ribavirin, 96 (22/23) for sofosbuvir and simeprevir, 95 (35/37) for ledipasvir/sofosbuvir with or without ribavirin, and 71 (12/17) for sofosbuvir and ribavirin. The SVR rate was 95-percent (70/74) in patients who reported full adherence to treatment; others had lower rates (p equal to 0.009). SVR rates did not differ by age, BMI, gender, ethnicity, cirrhosis, treatment history, GT, diabetes, HCC, regimen, transplant type, or time since transplant (p greater than 0.05).

**Conclusion:** DAA regimens were highly effective in treating HCV in transplant recipients. Elbasvir/grazoprevir is not recommended in the current HCV guidance for transplant patients, yet all patients treated with this regimen achieved SVR. Comparison across groups was limited due to small numbers, but SVR did not differ by treatment or demographics; only adherence impacted SVR. Immunosuppression levels should be monitored closely with HCV treatment as many patients required dose adjustments.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-090

Poster Title: Analysis of the usage profile and clinical evolution of patients treated with ceftolozan/tazobactam in a tertiary hospital

Primary Author: Cristina Mondelo García, Xerencia Xestión Integrada A Coruña; Email: cristina.mondelo.garcia@sergas.es

Additional Author (s):
Marta Lestón Vázquez
José María Gutiérrez Urbón
Noelia Fernández Bargiela
María Isabel Martín Herranz

Purpose: Ceftolozan/tazobactam (C/T) is a new beta-lactam antibiotic belonging to the cephalosporin group. It has been authorized for the treatment of complicated intra-abdominal infections associated with metronidazole, for complicated urinary tract infections and for the treatment of acute pyelonephritis. C/T is active against gram positive and negative bacteria, including some nonfermenting bacteria and multidrug resistant Pseudomonas aeruginosa (MRPA). Our objective is to analyze the usage profile and clinical evolution of patients treated with C/T assessing compliance with the inclusion and usage criteria after its approval by the Committee of Infectious Diseases and the Committee of Pharmacy and Therapeutics of our hospital.

Methods: Retrospective observational study of all patients treated with C/T from April 2016 to June 2017 in a tertiary hospital. The use of C/T was approved for the treatment of severe infections in adult patients caused by Pseudomonas aeruginosa resistant to all beta-lactams (including carbapenemases) and quinolones, after being checked for sensitivity by the Microbiology Service and evaluated by a multidisciplinary team. Data collected: age, sex, C/T indication, prescribing department, previous antibiotic treatments, C/T treatment days, renal dysfunction, microbiological data, adverse effects and result of the treatment (cure or death). Data sources: electronic medical records and electronic prescription program.

Results: We identified 19 episodes in 15 patients (10 men, mean age 69.2 ± 15.8 years old). Indications of C/T were: respiratory infection (7), urinary tract infection (2), osteoarticular infection (3), bacteriemia (1), intra-abdominal infection (1) and surgical wound infection (1). All
patients had positive cultures for MRPA and consequently they received 1-2g C/T three times a day except 4 patients (27%) who required a dosage adjustment for renal failure. There were 2 patients who did not receive any antibiotic before C/T, in the other 13 patients the most common antibiotics prior to C/T were: aminoglycosides, colistine, quinolones and carbapenems. The mean duration of the treatment with C/T was 32 days (7-110). Positive cultures for MRPA which caused the beginning of the treatment with C/T in each patient were distributed in sputum (7), intraarticular fluid (3) blood cultures (2), urine (2) and pleural fluid (1). C/T was prescribed in monotherapy in 5 patients, the rest of patients were treated with a dual therapy regimen with colistin (5) and tobramycin (5). One patient died during the treatment with C/T due the infectious disease, the rest of patients performed favorably. There was not any relevant adverse effect related to C/T which caused the discontinuation of the treatment.

**Conclusion:** C/T is a safe and effective alternative to the treatment of severe infections caused by Pseudomonas aeruginosa resistant to all beta-lactams (including carbapenemics) and quinolones.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-091

Poster Title: Incidence of acute kidney injury (AKI) in patients receiving concomitant vancomycin and piperacillin/tazobactam (P/T)

Primary Author: Delilah Navarro, King’s Daughters Medical Center; Email: navarro5@marshall.edu

Additional Author (s):
Jessica Sobnosky
Brittany Riley

Purpose: AKI is associated with increased patient mortality, hospital length of stay, and hospital costs. The body of evidence supporting a link between the use of combination therapy with vancomycin plus P/T and the development of AKI is increasing. This combination of antibiotics is frequently utilized for empiric therapy in hospitalized patients. As a result, the hospital’s antimicrobial stewardship team was tasked with assessing the incidence of AKI in this population.

Methods: A retrospective chart review including patients from October 2016 through January 2017 was performed. Fifty patients on vancomycin plus piperacillin/tazobactam (V-P/T) were compared to fifty patients on vancomycin plus cefepime (V-C) to assess a correlation with AKI. Adult patients who were on both antibiotics for a minimum of two days were included. Patient selection for each group was randomized. Patients were excluded if their baseline serum creatinine (Scr) was greater than 1.2 mg/dL or they were receiving renal replacement therapy. Data was obtained from the electronic medical record and included age, sex, length of stay, Scr, antibiotic doses, vancomycin trough levels, concomitant nephrotoxic drugs, development of AKI, and AKI duration. AKI was defined by either a Scr increase of 1.5 times baseline or more, a Scr increase of 0.3 mg/dL or more, or a glomerular filtration rate (GFR) decrease of twenty-five percent or more. Chi-squared tests were used to analyze all categorical data and Student’s t-test was used for continuous data.

Results: Overall, sixteen patients developed AKI with the majority being in the P/T group (V-P/T = 11 patients; V-C = 5 patients; p-value 0.102). While the result was not statistically significant, it was felt to be clinically significant due to the detrimental effects of AKI on hospitalized patients. Loop diuretics and NSAIDs were the most common concomitant nephrotoxic agents

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
in the P/T group. P/T was appropriately adjusted for renal function in all the patients included. AKI duration ranged from one day to seventeen days (mean 5.6 days; median 3.5 days). No correlation between AKI and vancomycin trough levels was observed. Thirty patients in the V-P/T group received a vancomycin loading dose while thirty-six patients in the V-C group received a loading dose. Of these patients, nine in the V-P/T group had AKI compared to four in the V-C group. No correlation was found between total daily vancomycin doses and incidence of AKI.

**Conclusion:** The combination of V-P/T trended toward increased incidence of AKI compared to the V-C group. While V-P/T may be warranted in certain patients, efforts to promptly streamline antibiotic therapy are necessary to reduce risk factors for AKI. Utilization of V-C may be an appropriate alternative empiric therapy choice due to the lower incidence of AKI in these patients. Results of this study were presented to the pharmacy team members and the hospital providers.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-092

Poster Title: Using V.A.C. device to deliver susceptible antibiotic through irrigation as a salvage therapy for chronic wound infection - process and clinical outcomes

Primary Author: Thao Nguyen, Adventist Health White Memorial; Email: nguyentd@ah.org

Additional Author (s):
Alexandra Tu
Stan Mathis
Byron Williams

Purpose: Vacuum-assisted closure (V.A.C.) is a wound care adjunct therapy that utilizes negative pressure. Traditional treatment of wound infections is systemic antibiotics in addition to surgical intervention, but this can cause antimicrobial resistance and systemic adverse drug reactions such as renal failure and C difficile superinfection. Irrigating antibiotics through V.A.C. device can provide higher drug concentration at the site of infection with minimal side effects. This prospective pilot study investigates whether the V.A.C method could serve as an effective alternative to traditional wound therapy.

Methods: Study patients will be initially treated with standard therapy, which includes systemic antibiotics and wound debridement. The study patients will then undergo salvage treatment with antibiotic irrigation through a V.A.C. device. Selection of antibiotic therapy is determined based on cultures and susceptibilities. The treatment team that includes an infectious disease (ID) physician, a podiatrist, and a pharmacist will estimate the severity of wound infection to determine the appropriate antibiotic selection. V.A.C. device parameters will be determined based on the severity, shape, and location of the wound. Patient will need to return to the limb-preservation clinic two to three times a week for proper wound care and assessment until the infection is resolved. Labs and cultures will be collected weekly. Antibiotic and V.A.C. parameters will be adjusted based on culture results, wound status, and patient tolerance. In-between clinic visits, the study coordinator, a pharmacy resident, will call the patient or designated caretaker daily to follow up on wound condition and tolerance to the V.A.C therapy. Duration of therapy is dependent on the wound status. The primary endpoints include clinical outcomes, pathogen eradication and resolution of infection, from ten pilot study patients.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: Currently, one patient has been recruited and started on V.A.C. therapy. 69 year old male with chronic, recurrent, right foot wound infection, status post third, fourth, and fifth toe amputations, was enrolled. Baseline wound culture grew heavy Pseudomonas aeruginosa (PSA) sensitive to only gentamicin and tobramycin. Based on susceptibility, tobramycin was prescribed for V.A.C. irrigation. Patient was treated for one week of antibiotic irrigation therapy, during which the patient’s wound decreased in size with light growth of PSA from the wound culture. There was a 4% decrease in area, 26% decrease in volume, and 36% decrease in tunneling of the wound from baseline. Wound site showed granulation tissues. The patient elected to withdraw from the study due to intermittent pain and dressing leaks. Pain and leak management were developed to improve future patient experiences and prevent drop-outs.

Conclusion: The standard of care for chronic wound infections traditionally involves systemic antibiotic, which leads to systemic adverse reactions and may not always resolve the infection due to limited drug concentration at the site of infection. Antibiotic irrigation delivered through negative pressure wound therapy could be a new therapeutic approach to treat chronic wound infections in patients who cannot tolerate or do not improve on systemic antibiotics only. A successful rate of 60% will warrant further investigation from a larger study.
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-093

**Poster Title:** Evaluation of telavancin substitution for daptomycin in skin and soft tissue infections at an academic medical center

**Primary Author:** Joseph Oliva, Beth Israel Deaconess Medical Center; **Email:** joeoliva0@gmail.com

**Additional Author (s):**
Christopher McCoy
Monica Mahoney

**Purpose:** Several broad-spectrum antibiotics are available for the empiric treatment of acute bacterial skin and skin structure infections (aBSSSI). Beta-lactam antibiotics and vancomycin remain mainstays of therapy, but daptomycin and telavancin may be used as alternatives in specific situations. At Beth Israel Deaconess Medical Center (BIDMC), daptomycin is frequently used as second line therapy. The purpose of this study was to evaluate the utility of telavancin instead of daptomycin as second line therapy for the treatment of aBSSSI and the resulting impact on budget.

**Methods:** This single-center, retrospective review was approved by the institutional review board at BIDMC in Boston, MA. Adult inpatients receiving daptomycin with a computerized provider order entry (cPOE) indication of aBSSSI between 1/1/16 - 12/31/16 were included. Pertinent data collected were patient height and weight, serum creatinine, daptomycin dose and duration, baseline QTc interval, concomitant QTc prolonging medications, and reason for vancomycin avoidance. Ineligibility for telavancin substitution were contraindications and warnings based on the FDA approved package insert related to renal insufficiency, QTc prolongation, pregnancy, infections or history of infections due to vancomycin-resistant Enterococci (VRE), vancomycin hypersensitivity, and/or receipt of concomitant heparin infusions. The cost associated with switching from daptomycin to telavancin was calculated in a variety of scenarios.

**Results:** Fifty inpatients received daptomycin with cPOE indication of aBSSSI and were evaluated for inclusion. On average, patients were 55 years old, 46 percent male, weighed 78.5 kilograms, and 58 percent (29 patients) were classified as obese. Eight patients (16 percent) had chronic kidney disease and 4 patients (8 percent) were on hemodialysis. cPOE indication
selection was concordant in approximately half of the patients. Bone/joint infection would have been a more appropriate indication in another third. Thirteen patients (26 percent) received daptomycin doses of 4mg/kg, 8 patients (16 percent) received 6mg/kg, and 17 patients (34 percent) received greater than 6mg/kg. Consistent with national aBSSSI treatment guidelines, most patients did not have cultures obtained. However, 28 patients did have cultures drawn; the majority were methicillin-resistant Staphylococcus aureus and/or polymicrobial. Overall, 9 patients were eligible for telavancin therapy. The most common ineligibility reasons were vancomycin hypersensitivity and isolation/history of VRE. These were also the most common reasons for avoiding vancomycin therapy. The average cost of changing from daptomycin to telavancin was calculated on all 50 patients, those deemed eligible for conversion to telavancin, as well as other methods. In all instances, the cost of telavancin was greater than that of daptomycin.

**Conclusion:** At our institution, we found low numbers of patients who would qualify for a switch from daptomycin to telavancin for the treatment of aBSSSI. This, combined with the higher cost of telavancin, does not support a change in our current practice.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-094

Poster Title: Susceptibility testing of oritavancin against vancomycin resistant, daptomycin non-susceptible Enterococcus faecium utilizing commercially available gram-positive plates

Primary Author: Alla Paskovaty, Memorial Sloan Kettering Cancer Center; Email: paskovaa@mskcc.org

Additional Author (s):
Renata Shamis
Ngolela Babady
Susan Seo
Mini Kamboj

Purpose: Treatment of bloodstream infections (BSI) due to vancomycin-resistant enterococcus (VRE) is challenging due to limited therapeutic options. Patients with cancers and stem cell transplant recipients are especially vulnerable to VRE BSI during periods of neutropenia. Daptomycin is commonly used to treat VRE infections, however non-susceptibility to this drug is a growing problem. Oritavancin, a synthetic lipoglycopeptide has demonstrated in vitro activity against VRE. This report describes in vitro susceptibilities of oritavancin for VRE isolates obtained from patients with VRE BSI. The testing was restricted to isolates with DAP MIC ≥ 4mcg/ml.

Methods: From 2009-2015, Sixty-one unique VRE blood isolates, obtained from 60 patients, had daptomycin MIC ≥ 4 mcg/mL identified on initial screening by Microscan. Testing was performed with Sensititre™ plate (FDANPF; Thermo Fisher) following manufacturer instructions. Colony count was confirmed for each plate. The ATCC control isolate was run on each day of testing, according to CLSI M07-A10 and CLSI M100-S25 standards for broth microdilution method and interpretation. All testing was performed by the same technician.

Results: Inoculum concentration for each isolate was within CLSI broth microdilution method guidelines. VRE reference strains yielded anticipated results. Median oritavancin MIC for VRE isolates was 0.06 mcg/mL (range: 0.008-0.25). Median linezolid MIC was 2 mcg/mL (range 1-16). Median tedizolid MIC was 0.5 mcg/mL (range 0.25 to > 4). All 61 (100%) isolates had vancomycin MIC >16 mcg/mL. Nearly all (60/61, 98%) isolates had ceftaroline MIC > 64

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
mcg/mL. Fifty-seven (93%) of 61 isolates were resistant to clindamycin. Additionally, 49 (80%) and 59 (95%) of 61 isolates had telavancin and dalbavancin MIC > 2 mcg/mL, respectively.

Conclusion: For VRE isolates with daptomycin MIC > 4, the median MIC for oritavancin was 0.06 mcg/mL. Susceptibility testing of oritavancin can be performed using the commercially available Sensititre™ gram positive plate (FDANPF). Our report demonstrates the potential of Oritavancin as a therapeutic option for the management of serious and difficult to treat VRE infections. Prospective studies are needed to evaluate oritavancin role in clinical practice.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-095

Poster Title: Retrospective analysis of first dose ampicillin turnaround times for newborns in a level III neonatal intensive care unit

Primary Author: Kerry-Ann Peters, Plantation General Hospital; Email: kenecian@yahoo.com

Additional Author(s):
Huston Powell

Purpose: Neonatal sepsis is defined as systemic infection with bacteremia in the first month of life. Early empiric and targeted antibiotic therapies within one hour is critical to decrease morbidity and mortality. According to the National Institute of child health and development, the most common pathogens are group B Streptococcus and Escherichia coli. Neonatal sepsis has a 20 percent mortality rate, with an incidence of 1 to 2 cases per 1000 live births. The recommended empiric therapy for neonatal sepsis is ampicillin and an aminoglycoside. This choice of therapy is cost-effective, offers low rates of resistance and synergistic killing.

Methods: Retrospective review of all ampicillin administered to newborns in the NICU from January 1, 2016 through to December 31, 2016. In our current process, pharmacists reviews the physician’s orders and validates that the dose and frequency are appropriate based on the patients gestational age and weight. If the order is accurate, a label is generated in the IV room for preparation by a technician in a sterile environment. The final product is presented back to a pharmacist for final check. No order leaves the pharmacy for any patient in the NICU or Pediatrics unless the weight is written or printed on the medication label. The difference in time from physician order entry into the computer system and the time nurse scanned for administration was recorded for each patient reviewed.

Results: One hundred and forty eight neonates received ampicillin during the data collection period. The total time difference from CPOE order entry to drug administration was 13329 minutes. The average turnaround time calculated was 90 minutes per order. Pharmacy preparation of first dose ampicillin falls outside of the recommend one hour window to impact morbidity and mortality.

Conclusion: The current process does not support the best outcomes for neonates. Limitations of the study included no breakdown of time from order entry to verification by pharmacist,
pharmacy preparation time and delivery to nursing unit, and time from delivery to administration. This additional information would have been helpful to identify key areas for improvement; however, the retrospective analysis was helpful to reveal overall deficiencies in our current processes. Nursing and pharmacy will work together to facilitate nursing mixing the first dose, withdrawn from the automated dispensing device and subsequent doses coming from pharmacy at the scheduled times.
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-096

**Poster Title:** Outcomes of rapid identification of multi-drug resistant gram-negative organisms causing bacteremia in combination with antimicrobial stewardship in a community health system

**Primary Author:** Sarah Ross, Scripps Mercy Hospital San Diego; **Email:** ross.sarah@scrippshealth.org

**Additional Author(s):**
Harminder Sikand
Eva Sullivan
Kristine Ortwine

**Purpose:** Rapid initiation of effective antibiotic therapy has been strongly associated with a decrease in mortality in gram-negative (GN) bacteremia. In an effort to improve time to effective antibiotic therapy in the treatment of multi-drug resistant (MDR) GN bacteremia, we implemented Verigene GN Blood Culture (BC-GN) assay, which can rapidly identify GN bacteria at the genus/species level and specific resistance markers from blood cultures within 2 hours of positivity.

**Methods:** The objective of this multi-center, pre-post quasi-experimental study was to assess outcomes of Verigene BC-GN in combination with antibiotic stewardship in treatment of MDR GN bacteremia. A retrospective chart review was performed one year prior and four months post-implementation of Verigene BC-GN. Patients > 18 years old with MDR GN bacteremia identified by Verigene BC-GN within 5 days of admission were included. The primary endpoint was time to effective antibiotic therapy for MDR GN bacteremia. Secondary outcomes included overall and ICU length of stay (LOS) and 30-day mortality. Education regarding interpretation of resistance markers and selection of optimal antibiotic therapy was provided to pharmacists and physicians prior to implementation.

**Results:** A total of 110 patients were included, 86 in the pre-intervention group and 24 in the post-intervention group. Mean time to effective antibiotic therapy decreased significantly from 47.6 ± 23.1 hours vs. 18.8 ± 9.1 hours, respectively (p < 0.0001). Median overall LOS was 6.0 vs 5.5 days (p=0.88), ICU LOS was 3.0 vs 4.0 days (p=0.57), and 30-day mortality was 4.7% vs 4.2% (p=1) pre and post-implementation, respectively.
Conclusion: Verigene BC-GN, in combination with antibiotic stewardship, successfully improved time to effective antibiotic therapy among MDR GN organisms causing bacteremia.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Infectious Disease / HIV

**Session-Board Number:** 7-097

**Poster Title:** Assessing of antibiotic prescribing in a Lebanese hospital

**Primary Author:** Marwan Sheikh-Taha, Lebanese American University; **Email:** marwantaha@yahoo.com

**Additional Author (s):**
Mouhamad Mazloum
Marwa Noueihad
Tania El Sabeh

**Purpose:** Antibiotics are commonly used in the treatment of bacterial infections. Overuse and inappropriate use of antibiotics leads to antimicrobial resistance as well as increased costs. The primary objective of this analysis was to evaluate the appropriateness of antibiotic prescribing, in a hospital setting, among adults and children for numerous indications.

**Methods:** We conducted a prospective chart review between November and December 2016 at a private hospital in Beirut, Lebanon. Patients receiving antibiotic therapy in the internal medicine or pediatrics services were included. Information gathered include demographic variables, comorbid conditions, physical findings, laboratory and radiographic studies, and patient medical management. Daily follow-up was performed for all patients during their hospital stay to document any changes in their physical findings, clinical status, laboratory and radiological results, and any subsequent alteration in antimicrobial therapy. Rating of the appropriateness of antibiotic use was done through analyzing patient's information and referring to the Drug Information Handbook, and the IDSA guidelines.

**Results:** One hundred and fifteen patients received antibiotic therapy for an average of 8.7 ± 16.3 days, 61 (53%) of which were females, and 73 were pediatric patients. The most common indications for antibiotic use were community acquired pneumonia (24.4%), followed by otitis media and bronchitis (9.6% each), and tonsillitis (7.8%). Thirty eight (33%) patients received inappropriate antibiotic therapy of which 16 (42.1%) patients had no indication for their use, 15 (39.5%) were not started on guideline recommended antibiotics, and 7 (18.4%) patients received antibiotics for inappropriate duration.
Among patients with no indication for antibiotics, 11 had bronchitis with no evidence for bacterial infection, and 5 had bronchiolitis. Among patients who were not started on guideline

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
recommended antibiotics, 9 had a first episode of tonsillitis and received broad spectrum antibiotics, and 2 with a urinary tract infection were started on a combination of ceftriaxone and ciprofloxacin. Furthermore, among 7 patients who received antibiotics for a wrong duration, 5 had surgical procedures and received therapy for an extended time. We were unable to assess the need for dose adjustment due to kidney dysfunction in all adults as their height/weight were not documented, and consequently, we were unable to compute creatinine clearance.

**Conclusion:** In our study, many patients received inappropriate antibiotic therapy. Educational interventions should focus on the importance of obtaining patients’ height and weight, since they are required for dose calculation, on avoiding the use of antibiotics when there is no indication for their use, on following the guidelines when choosing antimicrobial therapy, and on giving the drugs for an appropriate duration.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-099

Poster Title: Successful treatment of severe Legionella pneumophila pneumonia with combination levofloxacin and azithromycin therapy

Primary Author: Brandon Smith, UPMC Mercy Hospital; Email: smith1957@live.marshall.edu

Additional Author(s):
Balaji Shanmugam

Purpose: Legionella pneumophila is a clinically significant pathogen responsible for 2-15 percent of community acquired pneumonia (CAP) cases that result in hospitalization. Evidence has demonstrated a mortality rate of approximately 10 percent. We present the case of a 55 year old male with a history of heart failure who presented with four days of worsening dyspnea and productive cough in late November. He was found to be hypoxic with an oxygen saturation of 84 percent in the emergency department, and started on BiPAP. Chest x-ray was concerning for bibasilar opacities consistent with pneumonia. He was empirically started on ceftriaxone, vancomycin, azithromycin and oseltamivir. Blood and sputum cultures, respiratory viral panel, Streptococcus pneumoniae and Legionella pneumophila urine antigens were obtained. Labs were significant for hyponatremia, elevated serum creatinine consistent with acute kidney injury, leukocytosis with neutrophilia, elevated troponin and lactic acidosis. Electrocardiogram without evidence of ischemia and a QTc interval of 430 milliseconds. After failing non-invasive ventilation due to persisting hypoxia, the decision was made to intubate the patient for acute respiratory distress. Immediately following intubation, the patient suffered a presumed hypoxic cardiac arrest. Return of spontaneous circulation (ROSC) was obtained after one round of CPR and epinephrine (approximately 1 minute). He was started on vasopressors and transferred to the cardiovascular intensive care unit (CVICU). Upon arrival to the CVICU, emergent bronchoscopy was performed. He was diagnosed with severe acute respiratory distress syndrome (ARDS) and septic shock. He was paralyzed with cisatracurium and placed in the prone position for treatment of ARDs. Legionella urine antigen returned positive. Given the severity of the patient’s illness and the positive Legionella test, his antibiotics were changed to levofloxacin 750 mg IV every 48 hours (adjusted for renal impairment) and azithromycin 500 mg IV daily for synergy. He completed six days of combination therapy at which time the levofloxacin was discontinued and he continued treatment with azithromycin for a total of 21 days. His hospital course was further complicated by sepsis induced acute tubular necrosis (ATN) requiring two days of continuous renal replacement therapy. Subsequently diagnosed

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
with bilateral pulmonary embolisms and repeat echocardiogram demonstrated reduced ejection fraction 20-25 percent with severe global hypokinesis suspected to be due to legionella induced myocarditis. He was extubated on day 9, transferred out of the ICU day 10, and discharged on day 18. This case demonstrates the successful utilization of synergistic therapy for Legionella pneumophilia with levofloxacin and azithromycin. Multiple case reports and some small retrospective studies have demonstrated potential benefits of combination therapy. However, to-date, no specific guidelines have been established to dictate when this approach should be utilized. A formal Infectious Diseases (ID) consult was not obtained in this case; although the case was discussed with the ID attending on call who agreed with the dual therapy. Factors in our case contributing to the use of combination therapy included rapid: identification of the likely pathogen, severe illness characterized by septic shock and ARDs, and a young patient with relatively few comorbidities. Nevertheless, this strategy should be employed cautiously and in carefully selected patients due to the increased risk of adverse effects. Both classes of medications, Fluoroquinolones and Macrolides can predispose to QTc prolongation and Clostridium difficile infection which carry their own clinically significant morbidity and mortality. Fortunately, our patient did not experience any known adverse drug events related to his antibiotic therapy. Ultimately, this case contributes to the growing body of evidence supporting combination therapy in severe Legionella pneumonia. Ideally, additional investigation is warranted to determine the risk factors and patient populations who could experience the most benefit from this strategy in the future.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-100

Poster Title: Ampicillin and ceftriaxone combination therapy for Enterococcus faecalis meningitis

Primary Author: Norio Sugama, Sonoda Daiichi Hospital; Email: noritamago1976@gmail.com

Additional Author(s):
Tomona Iso
Yuki Uehara

Purpose: Ampicillin and ceftriaxone combination therapy (AC therapy) has a synergistic effect against Enterococcus faecalis (E.faecalis) in vitro. It has been suggested that AC therapy in vivo replaces ampicillin and gentamicin combination therapy for infective endocarditis by E.faecalis. Based on these findings, we report a case of meningitis by E.faecalis treated with AC therapy. A 68-year-old man living by himself, no history of allergy, drinking, and smoking. He had flu like symptoms 4 days before admission, and was prescribed some medications for the symptoms at a nearby clinic. He had symptoms of coffee ground vomitus and tarry stools 2 days before admission. And then, he visited emergency room and was admitted to the hospital with diagnoses of reflux esophagitis and hemorrhagic gastric ulcers. He had hypertension, hearing impairment, and untreated type 2 diabetes mellitus. His glucose level was 795 mg/dL at the time of admission and continuous insulin infusion was started. He was also administered famotidine for hemorrhagic ulcers. On the third day of hospitalization, he showed a 39-degree fever and disturbance. We suspected it was due to side effect of famotidine, so it was changed to lansoprazole. On the fifth day, neck stiffness was observed and cerebrospinal fluid examination was performed. He was diagnosed as bacterial meningitis, and antibacterial therapy with cefotaxime and vancomycin was started. On the ninth day, E.faecalis was detected from blood culture and spinal fluid culture, so we switched the antimicrobials to AC therapy. On the 17th day, human T cell leukemia virus type 1 (HTLV-1) antibody and direct smearing method of strongyloides stercorallis were found negative. AC therapy was continued for three weeks and treatment was successful. There is no report that intentionally used AC therapy for E.faecalis meningitis. Enterococcal meningitis accounts for 0.3-0.4% of bacterial meningitis, and most of the cases are postoperative infections. Spontaneous development is rare, but the mortality rate is high, as well as it is following bacteremia and usually associated with HTLV-1 and Strongyloides stercorallis. However, they were negative in our case. We infer that he developed cellular immunodeficiency due to untreated diabetes mellitus and the barrier

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
disruption of the gastrointestinal tract, which triggered bacteremia of E.faecalis followed by meningitis. The efficacy of combination therapy of ampicillin and gentamicin for E.faecalis meningitis has not been well established. There is only one randomized control trial which uses aminoglycoside combination therapy so far, and it reported aminoglycoside increased mortality in pediatric meningitis. Also, aminoglycoside has some concern with nephrotoxicity and hearing impairment, as well as it does not penetrate into cerebrospinal fluid. On the other hand, ceftriaxone is relatively safer and penetrate well. Therefore, AC therapy can be an effective alternative for E.faecalis meningitis.
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-101

Poster Title: Treating multidrug resistant Escherichia coli prostatitis with fosfomycin

Primary Author: Stefanos Torkos, Beth Israel Deaconess Medical Center; Email: stefano.torkos@gmail.com

Additional Author(s):
Joseph Oliva
Christopher McCoy

Purpose: A 74 year old male patient presented to the emergency department at Beth Israel Deaconess Medical Center (BIDMC) complaining of dysuria and little to no urine output for the past 3 days. This patient had previously visited an urgent care clinic and was prescribed sulfamethoxazole/trimethoprim for treatment of a complicated urinary tract infection (UTI). On the following day after experiencing little to no relief of his dysuria, urinary urgency, and low-grade fevers, he visited a urology clinic and was started on a 5 day course of once daily ceftriaxone and was instructed to continue taking sulfamethoxazole/trimethoprim as well. Still with no relief, he presented to BIDMC and was empirically treated with cefepime. He was diagnosed with complicated urinary tract infection due to recurrent bacterial prostatitis given recurrent elevation of PSA after it had previously normalized after treatment for his first episode of prostatitis as well as by his worsened obstructive urinary symptoms. Urine cultures were obtained and were positive for Escherichia coli that was multidrug resistant (MDR), to ampicillin, cefazolin, cefepime, ceftriaxone, ciprofloxacin, tetracycline, tobramycin, and sulfamethoxazole/trimethoprim. Susceptibilities were requested for fosfomycin and identified as susceptible. While fosfomycin is often chosen to treat uncomplicated cystitis with MDR, there is little experience with use of fosfomycin for concomitant prostatitis. Based a small case series, fosfomycin was prescribed at 3 grams daily. After 1 week of fosfomycin therapy, the patient showed signs of clinical improvement, was discharged, and scheduled to complete a 12 week course. At week 3 of follow up, he presented to the infectious disease clinic at BIDMC showing continued clinical improvement. However, the patient did endorse gastrointestinal side effects as a result of fosfomycin therapy which were tolerable with symptom control. This case is an example of the utility of fosfomycin in treatment of multidrug resistant pathogens in the setting of prostatitis.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Infectious Disease / HIV

Session-Board Number: 7-102

Poster Title: Empyema caused by Clostridium difficile

Primary Author: Anita Venuto, AtlantiCare Regional Medical Center; Email: anita.venuto@atlanticare.org

Additional Author(s):
Shimeng Liu
Hien Nguyen
Joseph Reilly
Manish Trivedi

Purpose: The following report describes a case of extraintestinal Clostridium difficile infection (CDI) presenting as an empyema in a patient at a community hospital. A seventy-one-year-old male with an extensive past medical history of hypertension, dyslipidemia, coronary artery disease with stent placement, atrial fibrillation, pulmonary hypertension, and multiple gastrointestinal surgeries presented to the emergency room with an altered mental status, coughing, and fevers for the past three days. The chest X-ray showed linear opacity at the right base and a small to moderate-sized left pleural effusion. A computerized tomography chest scan showed evidence of a possible empyema. After cultures were collected, intravenous vancomycin and piperacillin-tazobactam were started empirically for suspected healthcare-associated pneumonia. The patient was admitted to the medical-surgical floor, and an infectious disease physician and pulmonologist were consulted. The pulmonologist recommended consulting thoracic surgery for possible intervention due to the presence of the empyema. On day four, blood, sputum, and urine cultures revealed no growth, and the infectious disease physician recommended continuing with antibiotic therapy. On day seven, the patient underwent a pigtail drainage catheter placement for the pleural effusion, and the pleural fluid culture was collected. On day ten, pleural fluid culture revealed the presence of monomicrobial infection with Clostridium difficile. The patient had no known prior history of CDI. Vancomycin and piperacillin-tazobactam were discontinued, and the antibiotic therapy was changed to cefepime and metronidazole. On day eleven, the patient had a video-assisted thoracoscopic surgery with partial rib resection and partial lung decortication. Lung tissue culture was collected and confirmed the presence of Clostridium difficile with no evidence of other microorganisms. On day eighteen, the patient’s clinical status improved, and the patient was discharged to home with outpatient follow-up with an infectious disease physician to

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
continue cefepime and metronidazole for a combined total of twenty-one days. A literature search on empyema due to Clostridium difficile revealed limited information. Specific guidelines are not available for the treatment of extraintestinal CDI. The majority of reported extraintestinal CDI cases were polymicrobial, and antimicrobial therapy was directed at all organisms. In our case report, the patient had a rare monomicrobial infection with Clostridium difficile. This case provides an example where extraintestinal CDI was successfully treated with cefepime and metronidazole.

*SPECIAL SYMBOLOGY continued on are not extraintestinal CDI. This case provides an example where extraintestinal CDI was successfully treated with cefepime and metronidazole.
Submission Category: IV Therapy / Infusion Devices

Session-Board Number: 7-103

Poster Title: Analysis of smart pump continuous quality improvement (CQI) data across multiple organizations

Primary Author: Mohammed Al-Sukhni, Baxter Canada; Email: mohammed_al_sukhni@baxter.com

Purpose: Smart pump technology increases safety of intravenous infusions by using configurations and alerts that reduce medication errors. Continuous Quality Improvement (CQI) data generated from smart pumps provides insight into IV infusion practices. Using this data helps organizations to determine drug library compliance and identify frequency of safety events such as exceeding soft and hard limits. However, data is not frequently shared between organizations. The project’s aim was to identify opportunities for increased infusion safety by analyzing smart pump data from multiple organizations nationally.

Methods: A pooled, observational analysis was conducted on smart pump Continuous Quality Improvement data obtained from five different organizations across Canada for the month of November 2016. Continuous Quality Improvement data was generated at each institution through a gateway server that compiles pump events into reports and then pooled across organizations. No patient identifiers were included in the data. The reports analyzed include drug library compliance rates, frequency of soft limit alerts and frequency of hard limit alerts. The smallest organization included in the analysis had 286 pumps while the largest organization had 4174 pumps. Data from a total of 7430 pumps was analyzed. Data was weighted according to the number of pumps per organization. Investigation of the data examined the average drug library compliance, the frequency of alerts due to soft or hard limit events at each organization, and the top 5 drugs with soft and hard limit events across all organizations. Soft limit alert events consist of overriding the exceeded soft limit or modification of the dose to within the soft limits. Hard limit alert events occurred when the set hard limit was exceeded.

Results: An average drug library compliance of 97 percent was found nationally across the organizations included. Drug library compliance ranged from a low of 94 percent, up to a high of 99.93 percent. Analysis of drug library compliance by patient care area did not show a significant variance between sites. Soft limit exceeded alert percentage varied between sites, from a low of 3.6 percent to a high of 11.2 percent of all infusion starts. Hard limit attempted percentage ranged from 1.2 percent to 6.5 percent of all infusion starts between organizations.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
The top five drugs across all sites with soft limit events resulting in an override of the limit set were propofol, hydromorphone, heparin, vancomycin and norepinephrine. The top five drugs with soft limit events resulting in a modification of the dose to within the soft limits were morphine, propofol, ondansetron, vancomycin and heparin. The top five drugs with hard limit attempted events were heparin, IV fluids, vancomycin, piperacillin/tazobactam and amiodarone.

**Conclusion:** Data analysis of smart pump events across multiple organizations nationally provides the opportunity to improve drug library safety by focusing on common results when updating drug libraries at the individual site level. The top drugs leading to pump alert events as found in this analysis can be examined in detail to help reduce alert fatigue and increase infusion safety. The data shown can also be used as a benchmarking tool for other organizations when setting drug library compliance or safety event goals.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: IV Therapy / Infusion Devices

Session-Board Number: 7-104

Poster Title: Titration programming: don’t roll the dice

Primary Author: Tim Hoh, Baxter Healthcare Corporation; Email: tim_hoh@baxter.com

Additional Author (s):
Idal Beer
Ashley Martin

Purpose: High-alert I.V. medications are intended to be titrated during an infusion to achieve a targeted response. Each titration creates an opportunity for a programming error; however, unlike initial programming, in many cases titration programming may not be protected by traditional dosing limits of a smart pump drug library or EMR system. This study looks at the incremental dose changes for each titration programmed for 15 high-alert I.V. medications. Understanding titration practices can guide more effective infusion safety protocols and innovations in safety systems.

Methods: Infusion pump data for 45 hospitals were analyzed for the time period of October 2014 to July 2015. A total of 20,542 infusion pumps were analyzed with a total of 449,262 titration programming events from 15 high-alert I.V. medications. All titrations for each medication were analyzed for the percent change in dose based on the new dose programmed versus the previous dose that was infusing. In addition, the actual dose increment changes were analyzed to understand practice trends and compliance to titration protocols that were available for each medication. A comparison of the common incremental dose changes and the dosing limits configured for each medication was also conducted to determine the effectiveness of these traditional smart pump dose limits with respect to titration programming.

Results: Results indicated that on average, 92.5% of all titration programming for 14 high-alert medications had an incremental dose increase percentage of 100% or less. This means that majority of the dose increases were no more than doubling the previous dose. For the drug heparin, 93% of all titration programming had an incremental dose increase percentage of 40% or less. Analysis of the incremental dose change amounts revealed consistency, with the top 3 most common incremental dose change amounts for each drug representing 72% of all dose changes programmed for that drug. For the drug dobutamine, 49% of all dose changes involved an incremental dose change exceeding 4 times the recommended dose increment change of...
2.5 mcg/kg/min. Comparing the common incremental dose changes observed for each medication and the soft dosing limits configured showed that potential misprogramming of a titration ranging from 3 times - 100 times the intended dose increment may not be intercepted by traditional soft dose limits.

**Conclusion:** High-alert medications bear a heightened risk of causing significant patient harm when used in error. Each titration is programed with a specific incremental dose change to achieve a targeted response. Common trends are observed with the percentage dose changes and incremental dose change amounts during titration programming of the 15 high-alert medications. Traditional smart pump dosing limits configured for each medication are intended to provide safety for the minimum and maximum dose and may not be effective in protecting titration programming. Protocols and pump systems should be designed to protect all pump programming events, especially for high-alert drugs.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Leadership Development

Session-Board Number: 7-105

Poster Title: Impact of a structured residency preparation program on match results: one year later

Primary Author: Vicky Shah, Wilkes University Nesbitt School of Pharmacy; Email: vicky.shah@wilkes.edu

Additional Author(s):
Thomas Franko
Kristina Powers
Nicole Pezzino

Purpose: To determine the effectiveness of a six part residency preparation series on overall match rates for pharmacy residency candidates.

Methods: Six sessions were provided on campus as a preparation series for the American Society of Health System Pharmacists (ASHP) Midyear Conference and subsequent residency match. Prior to this year, three programs were already established including a general introduction to the residency process, a mock residency showcase and interview preparedness. The three new programs added this year were CV review, letters of intent and recommendation information and an etiquette dinner. The series was open to all students in their final year of pharmacy school and students were not required to attend all sessions and had the opportunity to select topics they wanted to attend. A chi-squared analysis was conducted on final match results comparing students who attended zero, one to two and more than three sessions.

Results: 24 students registered for the match, of which, 19 successfully acquired a residency program. Of the 19 who matched, 7 attended zero events, 5 attended one to two events and 7 attended more than three events. Corresponding match rates were 77.8%, 71.4% and 87.5% respectively (p = 0.74).

Conclusion: The addition of the three new sessions did not appear to have a significant improvement in match rate. However, anecdotal student feedback showed improved confidence and satisfaction in preparation for obtaining a residency. Further research is needed to better determine which sessions had the most impact in addition to the the actual vs. perceived benefit of the residency preparation series.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Leadership Development

**Session-Board Number:** 7-106

**Poster Title:** Utilizing mind-mapping technique to describe an antimicrobial stewardship program for clinical implementation of a 7 hour rapid antibiotic sensitivity system

**Primary Author:** Maureen Spencer, Accelerate Diagnostic; **Email:** mspencer@axdx.com

**Additional Author(s):**
Jennifer Marcenelle
Malcolm Bosewell
Levi Kirwin

**Purpose:** A new FDA cleared accelerated blood culture system, that identifies the organism within 90min and sensitivities with MICs within 7hrs, is now available for microbiology laboratories. The delay in current procedures of 48-72hrs results in overuse of empiric antibiotics that can result in inadequate treatment and development of adverse outcomes, such as Clostridium difficile. A mind-map is a diagram used to visually organize information to which associated representations of ideas and processes are added to enhance clinical implementation. This quality technique can be effectively used in clinical settings to enhance team work and analysis of an antimicrobial stewardship program (ASP).

**Methods:** A team of 10 key opinion leaders (KOLs), that included Pharmacists, Infection Preventionists, Microbiologists and Infectious Disease Physicians, were introduced to the use of mind-mapping as a tool to engage staff and obtain input into clinical implementation. KOLs worked in teams to draw the mind-maps and share conceptual ideas on making the business case for clinical adoption and implementation. Each specialty identified the processes and outcomes that could be used to support the microbiology laboratory's anticipated increased budgetary spend for the innovative equipment. Mind maps of the IDSA guidelines on antimicrobial stewardship program elements were designed to use as a gap analysis of the ASP program. In addition, mind maps were created related to the sepsis alert program and clinical response to targeted, versus empiric, antimicrobial therapy. Each team identified the clinical pathways that were used in their ASP program and then identified the gaps in their program and developed an action plan.

**Results:** Mind-maps included an extensive list of cost avoidance and return on investment opportunities that could be measured after clinical implementation of a rapid ID and AST blood
culture system. Benefits identified by the attendees included: 1) Reduced morbidity and mortality, 2) Enhanced patient and family satisfaction, 3) Enhanced bed utilization in ED, ICU, Nursing Units, Diagnostic areas 4) Potential reduction in MDROs, Clostridium difficile and cross-infection, 4) Reduced pharmacy costs and standardization of the pharmacy formulary, 5) More efficient lab processes and standardization of blood culture process, 6) Reduced hospital supplies as a result of targeted versus empiric antimicrobial therapy 7) Potential for reduced CMS penalties (readmissions with sepsis, progression to septic shock, C difficile), 8) Expedited transfers back to ECF or LTAC from rapid ID/AST results, 9) Rapid reporting of positive blood cultures and sensitivities in ED setting and ICUs resulting in decreased length of stay and improved bed management, 10) More efficient use of clinical staff - reduced Pharmacy med preps and nurse medication passes, enhanced micro blood culture lab processes, potential for reduced sepsis responses from sepsis teams, reduced isolation for MDROs and C difficile, reduced infection preventionist reporting of HAIs and reduced progression to sepsis cases.

**Conclusion:** Since time is of the essence with identification of bacteremia and sepsis, rapid sensitivities with MICs allows the healthcare team to escalate, de-escalate or revise treatment to more targeted therapy within 7 hours. As a result, care of critically ill patients and appropriate use of antibiotics is improved for the Antimicrobial Stewardship Program. The use of mind-mapping is an effective method to engage KOLs and hospital staff when implementing a multi-disciplinary approach to patient care. The ASP Committee can use this technique to engage the multidisciplinary team and identify the strengths and areas for improvement in their program.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Leadership Development

Session-Board Number: 7-107

Poster Title: Pharmacy leadership engagement among PharmD students: influence and barriers

Primary Author: Mitchell Tucci, Northeastern; Email: tucci.m@husky.neu.edu

Additional Author(s):
Kimhouy Tong
Kelly Chia
Margarita DiVall

Purpose: Leadership development among pharmacy students is critical to their continued success within the profession of pharmacy. In 2013, eleven competencies related to leadership CAPE outcomes were developed to guide student leadership development. The purpose of this research was to explore the impact of active pharmacy leadership engagement on student self-efficacy in the leadership competencies. Barriers to leadership involvement were also examined to help identify possible future interventions to improve leadership participation.

Methods: A web-based, voluntary, anonymous survey was developed to evaluate students’ perceptions and self-efficacy in leadership competencies. Using a four-point Likert scale, survey participants were asked to indicate their level of agreement to a series of statements corresponding to leadership competencies. Data on the extent of involvement in pharmacy and non-pharmacy extracurricular activities as well as barriers to extracurricular involvement were also collected for analysis. Active leadership engagement was defined as serving on the e-board or chairing a committee in a professional student organization within the previous 24 months. Students were also asked about their leadership engagement plans for the next 12 months and about post-graduate training (PGT) plans. Participants were queried twice regarding their intended level of future leadership engagement over the next year, before and after learning that leadership activities are a key consideration in selection of residency and fellowship candidates. Responses were stratified by professional year in the program and level of participation in extracurricular activities, and analyzed using the Mann-Whitney U test and the Kruskal-Wallis test. Differences in active leadership engagement history and future leadership activities with respect to PGT plans were identified using Chi-square test. This survey was approved by the institutional review board.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: The survey was completed by 362 students. Students who self-reported active leadership engagement in pharmacy organizations had statistically significantly better (p < 0.05) self-efficacy in 7 of 11 competencies compared to those who reported no pharmacy leadership engagement. No significant differences in leadership competencies were found between those who reported active engagement in non-pharmacy organizations and those without leadership engagement. Commonly cited barriers to participation were lack of time (54.6%) and academics (45.4%). Of those who reported lack of time, 71.6% cited a pharmacy-related job as a barrier. P2 and P3 students were most likely to focus on academics (56.86% and 49.15%, respectively). Two-hundred-sixty students (70.5%) planned to apply for PGT. Significantly higher active leadership engagement and future plans for active participation was seen among students with PGT plans. The majority of students with PGT plans (N=200, 77%) knew that leadership is an important consideration for PGT candidate selection. The proportion of those who were previously unaware of this association with plans to run for a leadership position in the next 12 months (N=60, 23%) increased from 8.3% to 26.7% upon learning that leadership is desirable in PGT candidates.

Conclusion: Pharmacy, but not non-pharmacy, active leadership engagement among pharmacy students was associated with significantly better self-efficacy in leadership competencies. Active student leadership involvement should be further encouraged in pharmacy programs, especially early in the curriculum. There is also an association between leadership engagement and PGT plans. The impact of active leadership engagement on candidacy for PGT should also be shared with students early in the curriculum. Identified barriers to leadership engagement will help guide future interventions to promote involvement in unengaged students.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Submission Category:** Operating Room Pharmacy

**Session-Board Number:** 7-108

**Poster Title:** Randomized trial of oral versus intravenous perioperative acetaminophen in hip and knee replacement patients

**Primary Author:** Skip Hickman, Kettering Health Network; **Email:** skip.hickman@ketteringhealth.org

**Additional Author (s):**
Douglas Lukens  
Kathleen Mathieson  
Lynne Bradford  
Casey Garman

**Purpose:** Intravenous acetaminophen is used extensively in our institution in the perioperative area as a part of multi-modal pain control. Few controlled trials have studied the efficacy of intravenous versus oral acetaminophen in this area. The purpose of this study was to determine if preoperative oral acetaminophen is equivalent to intravenous acetaminophen administered in the operating suite in controlling pain in the initial 24 hour postoperative period in patients receiving hip or knee replacement.

**Methods:** The institutional review board approved this single-center, randomized, placebo-controlled, double-blind, parallel group equivalence trial. Patients were 18 years of age or older undergoing total hip or knee replacement who provided informed consent to participate in the study. Target enrollment was 239 patients per group. Patients were randomized (1:1) to receive either two 500 mg capsules of acetaminophen orally plus a placebo intravenous infusion of 100 ml of normal saline (Oral group) versus an intravenous infusion of acetaminophen 1000 mg per 100 ml plus two oral placebo capsules (Intravenous group). Randomization was stratified by surgery type and patients were followed for 24 hours postoperatively. The primary study outcome was opioid use in the first 24 hours postoperatively, standardized to morphine milligrams equivalents (MME). The secondary outcome was patient-rated pain in the first 24 hours postoperatively, measured according to the institution’s standard of care. Other measured outcomes included time from PACU admission to first as-needed postoperative pain medication administration, length of PACU stay, length of hospital stay, documented nausea or vomiting, and hours to ambulate 10 feet postoperatively.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: There were 486 patients who received study medication and were included in a modified intention-to-treat analysis. No statistically significant differences in baseline characteristics between oral and intravenous groups were noted. There were also no statistically significant differences between the groups in regards to preoperative and intraoperative pain medication administration. Median MME of postoperative opioids in the oral group was equivalent to the intravenous group, and mean difference in MME of postoperative opioids between the groups fell within the pre-specified equivalence margin. There was no statistically significant difference between the groups in mean pain scores in the first 24 hour postoperatively. In addition, there was no statistical difference between the groups in any of the other outcomes that were measured.

Conclusion: The results of our study did not find any evidence that intravenous acetaminophen administered in the operating suite is superior to preoperative acetaminophen in reducing postoperative opioid requirements or pain. Additionally, our study did not find any evidence that intravenous acetaminophen is superior to oral acetaminophen in reducing postoperative nausea or vomiting, time to ambulation, time to first as needed pain medication, length of PACU stay, or total length of hospital stay in hip and knee replacement patients.
**Submission Category:** Operating Room Pharmacy

**Session-Board Number:** 7-109

**Poster Title:** Using RFID-technology to optimize medication par levels in anesthesia trays to increase anesthesiologist and OR pharmacy efficiency

**Primary Author:** Huzefa Raja, Edward-Elmhurst Health; **Email:** huzefa.raja@eehealth.org

**Purpose:** Increase convenience and availability of medications most often used for anesthesiologists; Reduce pharmacy turnovers of trays; Reduction in pharmacy time spent refilling trays; Follow best practice, compliance and regulatory standards.

**Methods:** Evaluate PAR levels and adjust up or down using breakpoints from actual usage data from KitCheck using the Advanced Segment Optimization report. User defined dynamic process breakpoint-95% of dispatches; Increase PAR levels for segments consuming MAX >10% of the time. Create a tray layout that creates easier access to fast moving drugs and that better matches our workflow. Workflow evaluation: Regulatory and compliance recommendations. Added some pre-filled syringes with embedded KitCheck tags.

**Results:** Fewer tray turnovers by pharmacy; Saves pharmacy time and labor; Increased Physician satisfaction/convenience; Improved patient care; Saves anesthesiologist/OR time and Regulatory compliant.

**Conclusion:** A pharmacist's ability to understand drugs used during surgery by anesthesiologists paired with actual data of medications used allows for pharmacy to design an anesthesia tray and create a dynamic process to adjust PAR levels of drugs in the anesthesia trays. The goal being to have adequate amounts of medications and pre-filled syringes which increases convenience for the anesthesiologists so they can focus more time to direct patient care and to reduce pharmacy labor spent replenishing used trays.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pharmacy Law / Regulatory / Accreditation

Session-Board Number: 7-110

Poster Title: Student pharmacist involvement in the assessment of a college of pharmacy curriculum

Primary Author: Karen Kier, Ohio Northern University; Email: k-kier@onu.edu

Additional Author(s):
Riley Sember

Purpose: ACPE 2016 standards have a strong focus on curricular assessment as part of continuous quality improvement (CQI). The goal of the assessment is to identify opportunities to enhance student learning and improve curricular outcomes. The college of pharmacy has developed an extensive assessment process. The college has an assessment committee that includes faculty, staff, and students. The student involvement has started to play a more critical role in helping define the assessment program as well as helping students to understand the CQI process. The college uses online exams which provide students with rationales to enhance the learning process after exams.

Methods: Faculty development sessions have encouraged faculty to use the rationales as teaching tools. A student member of the college assessment committee suggested that there was some perceived variability with the ability of the rationales to help students in the learning process. Therefore, the student proposed that the assessment committee study the utility of the exam question rationales. Student focus groups were recruited to participate in rationale evaluation by course and faculty member. Students participated in norming sessions. Inclusion criteria were required courses that used the software, while exclusion criteria were for faculty that had less than 12 questions evaluated. Rationales were scored from 1 to 5 (1 being the lowest and 5 being the highest) for ability to enhance learning and for the ability to answer the question correctly. Students were then provided with the correct answer to see if it matched what they had selected. The three variables defined and used in the analysis were the rationale average, the question average, and the answer average provided as a median value. Five different exams were evaluated. Data was analyzed using SPSSx v.22. Descriptive statistics and chi-square analysis (alpha of 0.05) were utilized. The data was compared in aggregate and then data was compared by course and by faculty member. The reliability was measured using a Cronbach’s alpha test. The reported Cronbach's alpha was 0.91.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** Analysis of the data did indicate a wide variability among the data both pertaining to courses as well as to faculty. Many of the rationales did not serve as an additional teaching tool for the students. Five courses were analyzed involving 238 questions and 21 faculty. There was a statistically significant difference between course (p less than 0.0001). A statistically significant difference was also observed between the faculty quality of rationales (p less than 0.0001). In two out of the five courses, the students were able to correctly answer the questions the majority of the time with the faculty provided rationale. Three out of the seven faculty with the largest percentage of questions, the students were able to correctly answer their questions the majority of the time with the rationales given. Faculty scoring ranked from a low of 1.18 to a high score of 4.79 out of 5. Course scoring ranked from a low of 1.96 to a high score of 4.64 out of 5.

**Conclusion:** Student involvement has been valuable in the assessment process. The data has helped to encourage faculty to re-evaluate their rationales and design them to provide a better understanding to their questions. Faculty development sessions have been designed to provide an opportunity for faculty to improve their question rationales to serve as a more productive teaching tool. This study has provided an opportunity for students to see the CQI process in action and to realize the importance of being involved in assessment to improve their educational experience. The college assessment committee continues to involve more students in the assessment process.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pharmacy Law / Regulatory / Accreditation

Session-Board Number: 7-111

Poster Title: Strategies for implementing a total waste management system in a high-volume, high-throughput inpatient pharmacy

Primary Author: Melissa Weber, University of Kentucky HealthCare; Email: melissa.montgomery@uky.edu

Additional Author(s):
Alicia Robinson

Purpose: Inpatient pharmacy distribution centers generate a large amount of diverse waste. Documents with protected patient information, recyclables, sharps, hazardous medications, and non-regulated pharmaceuticals are all waste forms generated in this setting. An audit of current practices for returning unused medications, and proper disposal of used or expired medications, was performed. The audit concluded non-compliance with state and federal regulatory agency guidelines, and outdated staff education and department policy. The objective of this project was to create a total waste management system that met compliance standards, addressed recycling goals, was easily translatable to staff and was sustainable over time.

Methods: Characterization-Identified appropriate designation for the types of waste generated. Each waste type was assigned to one of six categories; trash, recycling, non-regulated pharmaceutical waste, hazardous waste, sharps and reverse distribution.
*Transport and Disposal-Collaborated with environmental waste (EWD), recycling, and safety departments to coordinate timely removal and transport.
*Training and Education-Provided staff with both group and one-on-one instruction and demonstration. Designated a waste container education center within the pharmacy. Created a Total Waste Management Resource Guide for use as a reference. Divided implementation into 3 phases to aid transition.
*Implementation- A 90-day waste pilot program was conducted February 3, 2017 through April 30, 2017 to test implementation of the following: 1. A drain disposal protocol based on EWD recommendations. This program promoted drain disposal of returned, unused IV bags 250mL or greater. 2. A 30 gallon blue drum was added to accommodate non-regulated pharmaceutical waste. 3.Trash cans were replaced with five, 55 gallon recycling bins, and two 15 gallon recycling bins were added to our staff break room.
*Sustainability - Added waste training to new employee on-boarding education, plan to provide continuing education to all staff, and began performing daily “spot checks” to ensure compliance is consistent and maintained. Identified "Waste Disposal Champions," pharmacy technicians who volunteered to help educate other techs and ensure peers were following protocol.

Results: The implementation of the blue drum improved compliance by providing an alternate container for the disposal of non-regulated pharmaceutical waste, rather than the bio-hazard/sharps bin previously used. Prior to the 90-day pilot, a third party waste management company retrieved on average, 10 bio-hazard/sharps containers each day from pharmacy. Once non-regulated pharmaceuticals were disposed in the blue drums, bio-hazard/sharps usage dropped to 5-6 containers each day. Approximately 720 gallons of drug waste previously disposed of in the bio-hazard/sharps bin were now being properly wasted. Draining IV bags allowed us to conserve space in the blue drums. This permitted us to store a small number of the containers on-hand, which had been a concern due to space constraints. Exchanging the five trash cans with recycling containers and staging recycling containers in staff break rooms aligned inpatient pharmacy with the hospital's commitment to green initiatives, and allowed us to move from capturing only 10% of waste for recycling, to capturing 75%. Staff was able to better adjust to changes in workflow because implementation was done in phases. The one-on-one demonstrations, resource guide and waste container education center helped staff grasp new sorting procedures quickly, alleviating interruption to work flow and reducing stress.

Conclusion: The assessment team characterized waste types and categorized them according to disposal means, coordinated collection and transport with appropriate service departments, provided staff education, implemented new disposal procedures and waste containers, and developed a plan for ensuring compliance was maintained in the future. As a result, a Total Waste Management Resource Guide was developed and policies for proper waste disposal updated. Because of this investigation, pharmacy services will be better equipped to introduce complex procedural change and education to staff. In the future, the authors plan to focus on determining the reasons medications dispensed are often not administered.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Pharmacy Technicians / Competencies / Development

Session-Board Number: 7-112

Poster Title: Use of telepharmacy support staff to optimize efficiency and quality

Primary Author: Julie Beccarelli, PipelineRx; Email: jbeccarelli@pipelinex.com

Additional Author(s):
Jessica Althoff
Hong Lam

Purpose: Telepharmacy is a method used in pharmacy practice in which a pharmacist utilizes telecommunication technology to oversee aspects of pharmacy operations or provide patient-care services. Telepharmacy is generally practiced by a pharmacist in a remote location and involves providing services to multiple hospital facilities. In the hospital setting, the role of the pharmacy support staff, including pharmacy technicians, is well defined. However, in the practice of telepharmacy, the role of the pharmacy support staff continues to evolve. This poster will describe the role and function of the pharmacy support staff in a nation-wide telepharmacy services model.

Methods: The pharmacy support staff, called telepharmacy support specialists (TSS), utilized in this telepharmacy service are all experienced and nationally certified pharmacy technicians. Each evening, pharmaceutical care is provided remotely to over 100 hospitals. This process utilizes 10-15 pharmacists organized into teams to provide the telepharmacy service. The pharmacists are supported by 11 TSS staff members each night. A proprietary software system, PowerGridRx, aggregates all faxed, scanned and integrated electronic orders from the hospital clients into a consolidated work queue for review by the pharmacists. The TSSs sort and add patient identification information to the faxes prior to review by the pharmacist. In addition, the TSSs also triage incoming phone calls from nurses and other hospital staff, and assist the pharmacists by making phone calls to the nurse to request specific information, if needed. The TSS staff documents requests from the facility for the retiming of medication administration, changing of drug formulations, completion of STAT or now orders, and addressing of order omissions or duplications. After the initial call, the TSS will transfer calls from a nurse or provider to the pharmacist when clinical information is requested. Other non-patient care functions provided by the TSSs are also monitored. Data regarding TSS functions were collected from November 2016 to April 2017.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: Data collected over a 6 month period showed that, on average, the TSSs triaged over 63,500 orders and answered over 7,400 phone calls per month. Of the calls received by the TSS staff, 548 of them were transferred to the pharmacist which decreased the number of phone calls answered by the telepharmacists by 93%. The TSSs also made phone calls to the nurses to request patient allergies, weight and height if this data were missing before order processing by the pharmacist. On average, 50% of the phone calls from nurses were for STAT or NOW orders, 30% were to retime medication administrations and the remainder were for drug order clarification, label printing, drug availability in dispensing machines and order entry discrepancies. Non-patient care activities that the TSS staff provide include monitoring the work queue and call in extra resources as appropriate for workload balance and help pharmacist to follow-up on technical issues. The TSS staff members also help train and orient new staff members to the company’s policies and virtual work flows. The use of TSSs allows the telepharmacists to more effectively prioritize order entry, focus on clinical functions and avoid unnecessary interruptions of order processing.

Conclusion: Pharmacy support staff can effectively work with the telepharmacists to support the practice of pharmacy in a remote setting. Phone calls triaged by the TSS minimize cognitive disruption, thus, minimized variances. Order triaging and technical support significantly improve pharmacist efficiency and productivity. Future roles of pharmacy support staff include making phone calls for order clarifications, entering prescription data into hospital information systems for pharmacist verification, and taking and entering demographic data into the pharmacy system. Telepharmacy is a new and evolving practice area for pharmacy support staff and pharmacy technicians, allowing for continued growth and development in the field.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Pharmacy Technicians / Competencies / Development

Session-Board Number: 7-113

Poster Title: Effectiveness of identifying drug-related problems (DRPs) at an outpatient hospital pharmacy in Hong Kong

Primary Author: Ka Sing Chui, Hospital Authority; Email: kschi@hotmail.com

Additional Author(s):
Gary Chong
Wilson Chu

Purpose: The modern pharmacist has an expanded role on the provision of patient-centred pharmaceutical care. A vital component is the identification of drug-related problems (DRPs) from prescription screening. Due to manpower constrains, pharmacists could only screen for the majority of prescriptions for DRPs; dispensers and senior dispensers are needed to perform such screening. This may compromise screening of DRPs, and affect the flow of pharmacy operation when DPRs are identified at later stages by more experienced pharmacy staff members. This study was conducted to evaluate the effectiveness of identifying DRPs among pharmacy staff members at various steps of the dispensing chain.

Methods: This study was conducted at the Outpatient Pharmacy at a tertiary hospital in Hong Kong. A retrospective cross-sectional study was carried out between 13th March and 26th March 2017. Each prescription with a DRP identified was affixed with a red sticker. A number code was assigned to record the respective stages of dispensing flow (vetting of prescription, checking of assembled medications against the prescription, and issuing of medications to patients) where the DRP was identified, so as to evaluate the impact on the dispensing flow when the DRP was identified and handled at different stages. Interventions performed by pharmacy staff members were recorded on prescriptions for documentation. The identified DRPs were classified according to the Classification for Drug-related problems V7.0 devised by the Pharmaceutical Care Network Europe (referred to as “The PCNE Classification V 7.0”). The primary outcome was the percentage of DRPs identified by pharmacy staff members when the prescriptions were vetted into the local computer system, that is, at earliest stage of the dispensing flow. Secondary outcomes included the distribution of identified DPRs based on domains and categories according to “The PCNE Classification V 7.0”; the distribution of identified DRPs according to the stages of the dispensing flow, and among different grades of

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
pharmacy staff members (pharmacists, senior dispensers and dispensers), the percentage of successful pharmacy interventions performed by staff members.

**Results:** A total of 188 DRPs were identified during the aforementioned two-week study period. The majority of DRPs were identified at a later stage of the outpatient pharmacy dispensing workflow. 66 (35 percent) DRPs were identified when the prescription was vetted into the computer system, 36 (19 percent) were identified when the packaged medications were assembled and checked against the prescription, and 86 (46 percent) were identified when the medications were issued to patients. For the distribution of identified DRPs among pharmacy staff members, only 84 (44 percent) of the DRPs were identified by dispensers, while the rest were identified by senior dispensers or pharmacists. For the distribution of identified DRPs regarding their domains and categories according to “The PCNE Classification V 7.0”, 155 (82 percent) of the identified DRPs were related to a potential lack of effect of the pharmacotherapy to the patient, while 20 (11 percent) of which were related to potential adverse drug events experienced by patients. Pharmacy interventions regarding the DRPs identified were proposed to the corresponding prescriber, and 168 (89 percent) of these interventions were fully accepted by the prescriber.

**Conclusion:** The majority of DRPs were identified at the downstream of the dispensing flow by more experienced pharmacy staff members, suggesting a significant hindrance towards daily outpatient operation, and compromising the quality of pharmaceutical care. Pharmacist screening before prescription vetting could be considered to avoid delay of DRP identification. This study also urged the need of providing continual training on updates of pharmacotherapy and the proper use of drug information resources to single out DRPs. With continuous training, identification of DRPs could be more efficient and comprehensive while maintaining productivity. Further long-term studies are warranted to detect the suggested improvement.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Pharmacy Technicians / Competencies / Development

Session-Board Number: 7-114

Poster Title: Student perceptions of clinical skills before and after an objective structured clinical examination

Primary Author: Catherine Wente, Duke Regional Hospital/Campbell University CPHS; Email: catherine.d.lewis@duke.edu

Additional Author(s):
K. Paige Brown
Tina Thornhill
Beth Mills
Kim Kelly

Purpose: Prior to starting their advanced pharmacy practice experiences (APPE), third year pharmacy students participate in an objective structured clinical examination (OSCE) to assess their clinical skills in the areas of patient counseling, interpretation of laboratory values, calculations, and blood pressure monitoring. This is a one day event consisting of six stations which are administered and assessed by pharmacy faculty and residents. The primary purpose of this project was to determine how students perceived their clinical skills before and after participating in the OSCE and the secondary purpose was to characterize student preparation.

Methods: As in years past, students received detailed instructions approximately two months prior to the event which included the overall goal of the OSCE, topics to be covered, logistics of the day, and how students would be assessed. In preparation for the event, students this year were given opportunities to practice with the devices for counseling as well as to receive feedback on their blood pressure monitoring and patient counseling techniques. These practice sessions were organized by faculty and student participation was optional. Upon completion of the OSCE, students were asked to compare their ability regarding specific clinical skills before and after the OSCE utilizing a four item Likert scale ranging from strongly disagree to strongly agree. They were also asked to assess their level of preparedness utilizing a four item Likert Scale ranging from very unprepared to very prepared. In order to determine how students prepared, they were asked if they participated in optional practice sessions as well as how they prepared in general. Additional data collected included gender, age, current cumulative GPA, failure of any previous Therapeutics courses and highest level of education to date. This quality

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
improvement project was exempt by our Institutional Board Review (IRB) as it was part of the evaluation of an existing course.

**Results:** Survey participation was 116 out of 120 students which represents a response rate of 96.7%. In the areas of patient counseling, identification and prioritization of problems, and therapeutic planning, students assessed their abilities more favorably after the OSCE. Also, they had an overall perception of being prepared for APPE rotations despite a slight decrease in the strongly agree category for this item. Regarding preparation, students felt more prepared to teach a patient how to use a medical device while preparedness regarding taking a blood pressure remained relatively the same. Student feelings of preparedness regarding literature retrieval and asking appropriate questions declined. Also of note, despite an increased assessment of ability regarding patient counseling, there was a decrease in perception of preparedness in this area. Of the practice activities that were offered, 48.3% of respondents participated in the blood pressure practice, 77.6% participated in the device practice, and 38.8% participated in the patient counseling feedback opportunity.

**Conclusion:** The high survey response rate is indicative of student’s willingness to provide feedback on this OSCE exercise. Their assessment of abilities was overall more favorable; however, they came away from the event feeling like they could have been better prepared. Going forward, it may be beneficial to provide more practice opportunities throughout the year and to incorporate required events in addition to the optional practice, especially in the area of patient counseling.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-115

Poster Title: Implementation and impact of pharmacy preceptor orientation program at hospitals

Primary Author: Hanin Bogari, King Abdulaziz University; Email: hbagari@kau.edu.sa

Purpose: Improving training programs to achieve optimum goals, consistent input, and improve satisfaction and involvement of preceptors in different training programs.

Methods: A Preceptor orientation program was developed by the Faculty of Pharmacy approaching pharmacy preceptors at the hospitals which included two full day workshop and a monthly two hour workshop (total of 28 hours training) to discuss a variety of topics integral to preceptors development. The orientation program was divided into three main modules: professional precepting, rubrics for evaluation, and dealing with challenges. We collected Surveys from preceptors and students before establishing this program and a year after to measure effectiveness. Outcome measures include: student satisfaction, preceptor satisfaction, average scores of students, and number/ type of complaints raised to the Faculty of Pharmacy by students or preceptors.

Results: 40 preceptors were involved in this program from five different hospitals. 200 total number of pharmacy students, interns, and residents were included from a governmental Faculty of Pharmacy. Student satisfaction was 60 % in the pre program survey and 85 % post program survey. Preceptor satisfaction was 65% pre and 95% post. Average scores of students was 83% pre program and 89% post program, with reduction in the score inflation between preceptors by 20%. The number of complaints by students was 20% pre program and 5% post program. Preceptors complaints were 10% pre program and 1% post program.

Conclusion: Pharmacy preceptors orientation program implementation is effective to maintain training of pharmacy students, interns, and residents consistent with better utilization of training manual. We suggest such program to preceptors yearly to ensure quality of training and hospital preceptor better involvement.
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-116

Poster Title: Implementing a layered learning practice model for a pharmacist-managed outpatient clinic in a community hospital

Primary Author: Lindsay Celauro, Florida Hospital Celebration Health; Email: lindsay.celauro@flhosp.org

Additional Author(s):
Elizabeth Clements
Julia Nickerson-Troy
Ruthan Tattersall
Kristin Morse

Purpose: Layered learning practice model (LLPM) is an innovative approach developed to expand patient care and learners’ experiences by creating teams consisting of an attending pharmacy preceptor, pharmacy residents, and advanced pharmacy practice experience (APPE) rotation students. Florida Hospital Celebration Health (FHCH) Clinical Pharmacy Services (CPS) department implemented a LLPM starting July 2016 to better integrate the four preceptor roles (direct instruction, modeling, coaching, facilitation) into the daily workflow of the clinic. It was anticipated that the LLPM would improve team satisfaction and the feedback and evaluation process.

Methods: In the years prior to LLPM implementation, the traditional learning model was utilized. APPE students from multiple schools of pharmacy were assigned to an ambulatory care rotation at FHCH. When providing patient care, students would work with all available preceptors and residents, usually presenting patient cases to the first available pharmacist. While this provided the students with the ability to observe a variety of teaching and practice styles, it led to inconsistency in evaluations and student professional growth. Additionally, it inhibited teaching experience for the pharmacy residents. As part of an ongoing process improvement, it was determined that students could be better utilized as pharmacist extenders, and pharmacy residents could be more involved in teaching during the daily clinic workflow. For these reasons, a LLPM was implemented in July 2016. In this new model, teams typically consist of one attending pharmacy preceptor, one pharmacy resident, and one or two pharmacy students as available. Students have the same schedule as the rest of their team and work together to provide patient care in each clinic. An electronic, anonymous survey was
conducted in June 2017 to assess satisfaction and obtain feedback from students, CPS preceptors, and PGY1 residents who participated in the LLPM.

**Results:** Surveys were emailed to 21 APPE students and 15 responses were received. On average, students had completed approximately seven APPE rotations at the time the survey was conducted. Fifty-three percent of students reported they had no other rotations utilizing the LLPM. The remaining reported only one to three rotations utilizing a LLPM out of a possible 11. Satisfaction scores were high with the LLPM (86.7 percent, very satisfied) as compared to the traditional model (20 percent, very satisfied). One hundred percent of student respondents reported they received more frequent feedback with the LLPM. Some of the perceived benefits by students included working one-on-one with a preceptor or resident, increased patient care exposure, and improved autonomy. Some of the perceived weaknesses by students included lack of variety in teaching styles, personality conflicts, and scheduling variability. Additionally, surveys were sent to and completed by 11 current CPS preceptors and PGY1 residents to assess their satisfaction with the recently implemented LLPM. All respondents reported satisfaction with this model.

**Conclusion:** Implementation of a LLPM was found to be satisfactory to CPS preceptors, PGY1 residents, and APPE students. LLPM benefits both the learner and the teacher through integration of the four preceptor roles into the daily workflow. Additionally, having learners and teachers work side by side seemed to improve the process of feedback and evaluation. Feedback is given more frequently and at the time the event occurs, and the teacher can observe the progression of the learner over the course of the rotation.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**2017 Midyear Clinical Meeting Professional Poster Abstracts**

**Submission Category:** Precepting / Preceptor Skills

**Session-Board Number:** 7-117

**Poster Title:** Effect of an educational video mini-series on interprofessional preceptor development

**Primary Author:** Craig Cox, Texas Tech University Health Sciences Center School of Pharmacy; Email: craig.cox@ttuhsc.edu

**Additional Author(s):**
Herman Johannesmeyer

**Purpose:** Health professional preceptors complete preceptor development programs through a diversity of mediums. There are no head to head trials showing superiority of one medium over another. In this study we investigated the effectiveness of a professionally produced video mini-series to train interprofessional preceptors.

**Methods:** A 12-episode educational video mini-series had been previously produced. Each individual video episode is 7-11 minutes in length and builds upon the next. The series follows multiple health professional preceptors including nurses, pharmacists, physicians, speech-language-pathologists, occupational therapists, and physical therapists as they precept their students in both a hospital and extended care setting. Participants learn key principles regarding orientation, feedback, teamwork, and dealing with difficult preceptors or students. Preceptors from different health professions were recruited to view the mini-series and complete a series of pre, post, and reflection questions following each video episode. Following reflection questions, preceptors were provided expert advice. The expert advice was developed by a group of health professional preceptors and was designed to add an additional layer of learning to the program. Preceptors were given 30 days to watch all episodes and complete all corresponding assessments. The primary outcome was to determine the impact of the mini-series on a preceptor’s level of confidence in teaching students on interprofessional rotations. Data was analyzed to determine whether the preceptor’s profession, years of experience, or age had an impact on their responses. Secondary outcomes assessed preceptor’s level of engagement and attitudes towards the utilization of the mini-series format as a preceptor development medium. The study was approved by the local institutional review board.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Results: Sixty-one preceptors (19 medicine, 16 nursing, 18 pharmacy, 8 other) were enrolled in the study. A total of 33 preceptors completed all 12 video episodes. Confidence in preceptor ability significantly increased following completion of each episode (all episodes, p less than 0.05). No differences in age, profession, or years of experience were seen related to preceptor confidence. Preceptors enjoyed the mini-series and would strongly recommend it to others (5, interquartile range 4 - 5, 1 equals strongly disagree, 5 equals strongly agree). Preceptors that were pharmacists (p less than 0.001) and younger in age (p less than 0.001) were more likely to have more positive attitudes towards the mini-series. Expert advice for each episode was found to be helpful (5, interquartile range 4 - 5, 1 equals strongly disagree, 5 equals strongly agree). Engagement was high; physicians, nurses, and pharmacists averaged 54, 64, and 89 words per reflection question respectively with pharmacist responses being significantly longer than physicians and nurses (p less than 0.001).

Conclusion: The video mini-series format is a viable method of interprofessional preceptor development. It was effective in increasing preceptor knowledge and comfort in teaching students. Identifying incentives and other motivating factors to engage health professional preceptors in teaching development should become a priority. Utilization of the video mini-series in other settings such as the didactic classroom could also be pursued.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-118

Poster Title: Establishment of an advisory committee for secondary preceptors: An untapped resource to increase your preceptor pool and enhance professional satisfaction for a clinical float team

Primary Author: Abby Kim, Children’s Hospital Colorado; Email: abby.kim@childrenscolorado.org

Additional Author(s):
Jennifer Hamner

Purpose: As residency program directors (RPD) struggle to find a balance to maximize preceptor participation while minimizing burnout, the use of untapped clinical resources is essential. At our institution, secondary preceptors are comprised of clinical pharmacists on a focused float team. They focus in one of three areas including critical care, oncology and stem cell transplant or general medicine and surgery. They collaborate with primary preceptors to create a consistent and well-rounded rotation for residents. A secondary preceptor residency advisory committee was created to further engage secondary preceptors in resident learning and education while identifying areas for professional development.

Methods: Secondary preceptors created individualized preceptor development plans with the RPD based on the American Society of Health System Pharmacists (ASHP) preceptor requirements. Development plans identified the preceptors baseline knowledge and areas where additional development was needed to meet preceptor requirements as well as professional goals. Secondary preceptors met every other month as a group with the RPD for preceptor development pearls presented by primary preceptors and PGY2 residents as well as to discuss resident progress and questions identified by the group. During the primary preceptor residency advisory committee meetings, tasks were identified for delegation to engage secondary preceptors to help share the precepting load.

Results: Secondary preceptors identified and documented areas for professional development and set personal goals and timelines to meet ASHP preceptor requirements and obtain designation as a secondary preceptor within the institution. They were provided with group preceptor development pearls as well as individualized plans. The pearl topics varied based on a needs assessment of the preceptor group as well as areas of improvement for the preceptor

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
group as a whole. Creation of the preceptor advisory committee increased communication between primary and secondary preceptors, increased involvement and engagement with resident learning, projects, and presentations and improved professional satisfaction.

**Conclusion:** Creation of a secondary preceptor advisory committee engaged a focused float team to meet accreditation standards for preceptor status per ASHP requirements and obtain secondary preceptor status per institution requirements. In addition, secondary preceptors were provided opportunities to expand precepting experience and actively engage in our residency program providing improved professional satisfaction. Precepting pearls and discussions allowed professional development and equipped secondary preceptors with tools to enhance pharmacy resident education and learning. The active utilization of secondary preceptors allowed primary preceptors to share the precepting load to help decrease the likelihood of preceptor burnout.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Precepting / Preceptor Skills

**Session-Board Number:** 7-119

**Poster Title:** Analyzing student and preceptor opinions regarding two types of institutional introductory pharmacy practice experiences to improve educational outcomes

**Primary Author:** Craig Kimble, Marshall University School of Pharmacy; **Email:** craig.kimble@marshall.edu

**Additional Author(s):**
Robert Stanton
Amber Payne

**Purpose:** Analyze the optimal educational scheduling format for achieving associated educational outcomes and student success for institutional Introductory Pharmacy Practice Experiences (IPPE) rotations. Preceptors and students were surveyed to evaluate perceived advantages, disadvantages, and achievement of objectives in each of the two different formats with a goal of identifying the best scheduling design for student learning and classroom success.

**Methods:** The Institutional IPPE was offered in two scheduling formats consisting of 40 hours each. One was delivered concurrently during the academic year with two ½ day (4 hour days) a week scheduled over five weeks. This was the format used prior to this survey. The second design employs five consecutive eight hour days during the summer outside the traditional academic year. This was a format suggested by preceptor feedback. The activities, educational objectives, and assessment tools were identical for both rotation designs. Two different anonymous surveys were developed using the Qualtrics survey tool. One was released to students and the other to preceptors. Survey items were designed to assess which rotation style better met overall student learning and success. Student survey items assessed opinions related to aspects of the educational learning experience including student stress, commute times, navigating through an institution’s electronic health record, ability to monitor and evaluate patient care, learning activities, etc. Only students who had exposure to both IPPE design formats of instruction were surveyed. Preceptors’ opinions were similarly assessed to determine depth of exposure to educational activities, ability to monitor patient care, overall learning experience and achievement of educational outcomes. Only preceptors who had exposure to both design formats were surveyed. Approved by IRBNet ID# 468128-1.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Results:** The student response rate was 57 percent (42/74) with five respondents being excluded for not completing both rotation types. The students overwhelmingly indicated (95.4 percent of respondents) that the 5 consecutive day (40 hour) rotation in the summer was the overall superior scheduling format. Students also indicated (100 percent) that they liked the five day rotations to enhance their classroom learning. Advantages indicated by students included reduction in stress during the academic year, improved ability to balance class responsibilities and more realistic perceptions of work demands of pharmacists. However, students indicated less ability to develop preceptor relationships during the 5 consecutive day rotations. The preceptor response rate was 37 percent (16/43). Five day rotations were recommended by 100 percent of respondents. Preceptors indicated students get a better overall experience with five day rotations. Preceptors indicated this format reduced overall commute times, increased time on site, students were better able to discuss patient care decisions, preceptors were better able to answer student questions avoiding student demands, and a reduced overall orientation time. Challenges encountered with preceptors indicated that Mondays are challenging days for preceptors to complete orientation and students may not be seeing as many patient types vs. five week rotations.

**Conclusion:** Overall, both preceptors and students overwhelmingly indicated that the five consecutive day format in the summer provided a better educational experience compared to the ½ day twice a week for five week rotation design during the academic year. Preceptors and students indicated that they were better able to follow the patient care process and discuss patient care decisions and questions. Challenges encountered were limited, yet preceptors indicated that students may see less types of patients verses the five week rotations. Subsequently, based on feedback obtained from respondents, the school has changed the scheduling format of its institutional IPPE rotations.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-120

Poster Title: Creation of preceptor criteria and a preceptor-in-training program in a PGY1 pharmacy residency at a pediatric institution

Primary Author: Allison King, Children's Mercy Hospital; Email: arking@cmh.edu

Additional Author (s): Molly Camis

Purpose: The ASHP Board of Directors approved new PGY1 residency standards on September 19, 2014. The new standards created an absolute requirement for criteria for residency program directors (RPD) and preceptors compared to previously approved residency standards which had a recommended guideline for RPDs and preceptors. The new standards also created a category of preceptors-in-training. Residency programs were expected to adopt to the new residency standards by the beginning of the 2017-2018 residency year; thus requiring programs to create preceptor qualifications in order for their residency program to remain ASHP accredited.

Methods: Responses from annual Preceptor Academic and Professional Records were compiled in a de-identified fashion and brought to the Residency Advisory Committee (RAC). The RAC compared the preceptor responses from the compiled Preceptor Academic and Professional Records to the examples set forth in the Guidance Document for the ASHP Accreditation Standard for PGY1 Residency Programs. Based upon recommendations from the RAC, the RPD created a preceptor criteria worksheet and evaluated each preceptor to determine if they met the criteria to be a preceptor.

Results: A total of 29 preceptors completed the Preceptor Academic and Professional Record Form in 2015. Responses were de-identified and recorded in Excel spreadsheets. One sheet was made for each of the following categories: Recognition, Active Practice, and Ongoing Professionalism. Responses in active practice were further categorized into development of clinical or operational policies/guidelines/protocols, creation/implementation of a new clinical service or service improvement initiative, and appointments to organization committees. Responses in ongoing professionalism were further categorized into Membership and Service in National, State, and/or Local Professional Associations; Publications, Presentations, Posters, Other; Reviewer of publications; Moderator or evaluator at meeting; Faculty Appointment;

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Teaching Experience; Teaching Certificate Program; Program Participant; and Other Service. Responses in each of the categories indicated a wide variety in interpretation of the questions on the Preceptor Academic and Professional Record Form. The Preceptor Criteria worksheet was applied to each form completed by a preceptor. A total of 27 preceptors met criteria. Two preceptors were defined as preceptors-in-training. They were assigned a mentor and created a plan to become a preceptor in the next two years.

**Conclusion:** Application of the new residency standards affected all PGY1 residency programs, causing them to create preceptor qualifications that complied with the new residency accreditation standard. Some previous preceptors no longer met criteria to be a preceptor which required them to create a training plan to meet criteria in the next 2 years and operate under a mentor’s guidance until the criteria was met. Additionally, evaluation of responses on the Preceptor Academic and Professional Record Form highlighted a difference in interpretation among preceptors.

---

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Precepting / Preceptor Skills

**Session-Board Number:** 7-121

**Poster Title:** Development of a busy day toolkit for preceptors of pharmacy students

**Primary Author:** Allison King, Children's Mercy Hospital; **Email:** arking@cmh.edu

**Additional Author(s):**
Davina Dell-Steinbeck
Laura Watcher
Mayce Al-Sukhni
Trisha LaPointe

**Purpose:** The Section of Inpatient Care Practitioners (SICP) Section Advisory Group on Pharmacy Practice Experiences (SAG-PPE) provides resources to preceptors to enhance the preceptor/student experience. The SAG has developed a Busy Day Toolkit to add to resources in the Preceptor Toolkit already available on the American Society of Health Systems Pharmacists (ASHP) website. This new toolkit provides resources to preceptors to use during busy days when they have to be away from their student(s), providing the student(s) with an alternate meaningful learning experience. The Busy Day Toolkit may also be used when working with pharmacy residents.

**Methods:** A subcommittee of the SAG-PPE was formed to determine topics that would be appropriate for inclusion in the Busy Day Toolkit. Committee members suggested activities that would be of benefit both to student learning and to practice locations. Activities would ideally be generalizable to different rotations and amenable for customization to individual institutions.

**Results:** A list of proposed activities was generated by the subcommittee and then prioritized based upon subcommittee members’ skillsets and expertise. Initially proposed activities for the Busy Day Toolkit included development of literature evaluation skills; discussion of the Pharmacy Practice Model Initiative; tips on completing drug utilization evaluations and drug monographs; increasing familiarization and comfort with an institution's electronic medical record system; enhancement of skills related to interpreting lab values; refinement of understanding of biostatistics; and activities to enhance understanding of current reimbursement aspects of pharmacy. Five modules have been completed to date, and five more modules are in various stages of development. The SAG reconvenes in the fall of 2017

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
and will continue to develop and add to the toolkit. Future Toolkit developments will be based upon the needs of preceptors and best practices cited in the literature.

**Conclusion:** The SAG-PPE has completed five modules and is in the process of developing five more modules for the Busy Day Toolkit. Next stages include posting the completed modules on the ASHP website for preceptors, completing the modules in development, requesting feedback for areas of development, and creating new modules or editing existing modules in the toolkit.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-122

Poster Title: Residents’ perceptions of a University-based residency teaching certificate program

Primary Author: Trisha LaPointe, MCPHS University; Email: trisha.lapointe@mcphs.edu

Additional Author(s):
Kathy Zaiken
Judy Cheng
Maria Kostka-Rokosz

Purpose: To examine PGY1 residents’ perceptions regarding selection and effectiveness of didactic topics, as well as structure and teaching responsibilities of a University-based Residency Teaching Certificate Program (RTCP).

Methods: Over a 2-year period a voluntary, anonymous, ten question survey was administered via Qualtrics at the completion of the RTCP to residents of University co-sponsored programs in hospital, ambulatory care, managed care, and community pharmacy practice settings.

Results: Twenty-three residents completed the survey. The majority of residents felt that didactic topics were delivered effectively (73-100% based on topics). They also agreed on the choice of topics, felt they should remain for future offerings, and felt enough time was devoted to the topic. Only 25-71% (depends on topic) of residents responded favorably in regards to the enjoyment of the topic, suggesting that more interactive assignments be incorporated into the topic discussion. Sixty-eight to 100% (depends on topic) believed that the RTCP enhanced their ability to teach and precept students. In terms of teaching responsibilities, seven residents reported enjoying facilitation of small group case seminar the most. Residents would have liked more discussion related to construction of examination questions and student grading.

Conclusion: Overall, the residents believed that the RTCP was effective and enhanced their ability to teach. The majority of the responses indicated that the residents prefer small group teaching rather than teaching in a large group setting, which is to be expected at this stage in their career. Based on residents’ feedback, more interactive assignments will be incorporated in future offerings.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-123

Poster Title: Implementation of a team-based preceptor model for advanced pharmacy practice experience health-system rotations

Primary Author: Sierra Schmidt, The Johns Hopkins Hospital; Email: sschmi31@jhmi.edu

Additional Author (s):
Xuan Zhou
Patricia Ross
Cathy Walker
Samuel Culli

Purpose: This project aimed to expand Advanced Pharmacy Practice Experience (APPE) health-system rotations in the Critical Care and Surgery Pharmacy Division at The Johns Hopkins Hospital through implementation of a team-based preceptor model. Prior to this project, each decentralized pharmacist precepting a student was individually responsible for balancing clinical, operational, and precepting responsibilities during the rotation. This traditional preceptor model resulted in increased preceptor workload demand and challenges when preceptor staffing schedules did not conform to a standard workweek. This project’s goal was to incorporate students into the pharmacy division while sharing preceptor responsibilities and workload among pharmacists in preceptor teams.

Methods: Eleven decentralized staffing pharmacists (eight day shift, three evening shift) were chosen to participate in the project. Monthly meetings with pharmacy staff were held to discuss potential precepting models, student schedules, student responsibilities, and anticipated challenges with additional student rotations. The pharmacists were divided into three precepting teams of three to four pharmacists each, with each team having a team leader. A draft student schedule was developed and adjusted throughout the planning process. The final model assigned each student to one of the precepting teams, with the preceptor-of-record rotating among members of the team throughout the academic year. Finally, the model was trialed with the three team leaders and one precepting team member in March 2017. Changes were made to the precepting model based on strengths and limitations identified during this trial.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** The team-based preceptor model was implemented in May 2017 for the 2017-2018 academic year. The model engaged all full-time decentralized pharmacists in the division in student precepting. This model provided flexibility for each precepting team to adjust the standard student schedule to meet the needs of their team with regards to staffing times (daytime vs. evening), clinical responsibilities (rounding vs. non-rounding), and clinical areas of expertise. In the academic year prior to implementation of this project, two students completed health-system rotations in the Critical Care and Surgery Pharmacy Division. Through implementation of this project, ten students were accepted for health-system rotations in the following academic year, a four-fold increase. This expansion in the number of health-system rotation offerings also allowed additional students to be accepted into the Clinical Track Program at the hospital, a program in which students complete several consecutive APPE rotations at The Johns Hopkins Hospital.

**Conclusion:** The team-based preceptor model successfully allowed for increased APPE health-system rotation offerings for the academic year. Strengths of the team-based model included greater flexibility in matching student hours to preceptor schedules, exposure of students to multiple practice styles and approaches to clinical problem-solving, and sharing of preceptor responsibilities among multiple pharmacists. This shared responsibility allowed decentralized pharmacists to engage in student precepting while balancing a commitment to a robust clinical practice. Challenges in implementing the model included ensuring seamless communication among preceptor team members and providing pharmacists with the support needed to precept while managing clinical and operational responsibilities.
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-124

Poster Title: Using an electronic rubric to evaluate students' understanding of the pharmacist's patient care process (PPCP)

Primary Author: Jordan Sedlacek, Larkin University College of Pharmacy; Email: jsedlacek@ularkin.org

Additional Author(s):
Mostafa Elgebaly

Purpose: The Pharmacist Patient Care Process (PPCP) is a newly standardized approach to patient care being incorporated into the Accreditation Council for Pharmacy Education 2016 standards for schools of pharmacy across the country. The PPCP consists of five steps (collect, assess, plan, implement, follow-up: monitor and evaluate). To assess students’ competency in case studies, an electronic rubric has been developed based on the PPCP. Reliability of scoring on assessments can be improved using rubrics, as well as promoting learning and improving instruction. Decreased interrater variability by using rubrics has also been shown. The development of the electronic rubric is described here.

Methods: One pharmacy professor from each academic department (pharmaceutical sciences and clinical sciences) participated in the creation of the electronic PPCP form. There are two components to this electronic process, the student submission form and the faculty grading rubric. The student submission form has five essay-type questions for the students to answer, one for each step of the PPCP (collect, assess, plan, implement, follow-up). The students fill out this form based on a case, which is provided to the student in mock patient chart form. The PPCP rubric allows the faculty or preceptor to grade each step of the PPCP individually. This allows for identification of areas that the student is having difficulty in. The rubric consists of 4 categories of grades (excellent- 5 points, competent- 4 points, needs partial remediation- 3 points, needs full remediation- 0 points). Higher weights were placed on assessment and plan. The rubric is based on a competency level of 80 percent. For each section of the rubric key, detailed answers were provided for faculty graders to decrease grader variability from question to question.

Results: The primary author of this study used the electronic rubric to grade the clinical cases in an integrated course. The electronic case required significant training and work to set up,
however, the grading of the rubric was simplified. The grading process became more subjective and less objective by using the rubric.

**Conclusion:** This process of grading cases will be extended to the remainder of the courses in our three-year accelerated college of pharmacy program at Larkin University. The rubric will be continued to be used by both faculty and preceptors to decrease intergrader variability and increase reliability of scoring of students' cases.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-125

Poster Title: Designing, piloting, and evaluating an oncology pharmacy advanced pharmacy practice experience (APPE) research elective

Primary Author: Michael Steinberg, MCPHS University; Email: michael.steinberg@mcphs.edu

Purpose: To design a non-clinical experience to further develop the understanding of oncology pharmacy practice in clinical-year Doctor of Pharmacy students and impact their professional career pathways.

Methods: An oncology pharmacy APPE research elective rotation was designed for pharmacy students to take part in a rotation precepted by a board certified oncology pharmacist faculty member. Activities for the six-week rotation included a series of lectures delivered by the faculty member to explain the various roles of an oncology pharmacist and general strategies and foundations of information to treat cancer, participating student presentations on commonly used antineoplastic medications and management of select cancer types, current event discussions on oncology pharmacy in the news, and weekly book club club discussions regarding the book The Emperor of All Maladies: A Biography of Cancer by Siddhartha Mukherjee (Simon and Shuster, Inc. New York. 2010). Participating students were solicited to voluntarily complete a pre- and post-rotation written survey regarding their interest and knowledge in oncology pharmacy and consideration as a career choice. The use of a survey to gather information from students was approved by the University’s institutional review board.

Results: A schedule was created and delivered to students on the first day of the rotation after they completed the pre-rotation survey. A cap of four participating students was set for the rotation. These students were selected randomly from interested students who ranked the rotation within the Department of Experiential Education’s online software that determines rotation assignments. All the students on the rotation had worked in a pharmacy and half had dispensed oral chemotherapy medications in a retail pharmacy environment, but none had worked in an oncology pharmacy. Upon completion of the rotation, students’ understanding of oncology pharmacist activities went from zero being ‘very familiar’ or ‘somewhat familiar’, to all of them meeting this outcome. All four students were already intending on working as retail pharmacists upon graduation, but interest in becoming an oncology pharmacist in the future shifted somewhat from ‘not interested’ to at least ‘somewhat interested’ or ‘interested’. This was consistent with students’ interest in completing a pharmacy specialty residency or

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
becoming a board certified oncology pharmacist, or at least working in an oncology pharmacy. Written student comments affirmed these observations and noted their increased depth of knowledge and recommendation of the rotation to future students.

**Conclusion:** Although clinical APPE rotations provide students with active educational experiences, this pilot rotation shows that discussion and research-based elective rotations offer students valuable opportunities to learn about specialty niches, such as oncology pharmacy. These opportunities can guide career choices and better prepare students to work with patients in any environment in which chemotherapy and supportive medications are dispensed. The results indicate that the activities in this elective APPE rotation provided students with an effective way to learn more about oncology pharmacy that could impact career choices and better utilize oncology pharmacy knowledge even by pharmacists not specializing in oncology.
Submission Category: Precepting / Preceptor Skills

Session-Board Number: 7-126

Poster Title: Implementation and evaluation of a preceptor development subcommittee at a large academic medical center

Primary Author: Dustin Wilson, Campbell University College of Pharmacy & Health Sciences; Email: dwilson@campbell.edu

Additional Author(s):
Maegan Greenland
Meredith Moorman
Paul Bush

Purpose: Pharmacy residency programs have demonstrated significant growth over recent years. Thus, the number of pharmacists serving as residency preceptors has also grown. Successful preceptor development programs are vital to pharmacy residency programs, however many residency programs are often cited by the American Society of Health-System Pharmacists (ASHP) Commission on Credentialing as partially compliant with standards associated with preceptor development. As a result, a Preceptor Development subcommittee was created at our institution and charged with providing preceptors relevant and contemporary continuing professional education opportunities on preceptor development.

Methods: In December 2013, a Preceptor Development committee was created as a subcommittee of the Department of Pharmacy Education Committee. Members of the subcommittee consist of a faculty member from a local school of pharmacy who serves as chair as well as twelve preceptors from the various residency programs represented at our institution. The subcommittee developed a needs assessment survey that was distributed to preceptors in October 2014. Survey responses identified various preceptor development topics that the subcommittee used to coordinate future seminars. In addition, the subcommittee identified a need for funding to attend national meetings to enhance preceptor development. As a result, the subcommittee secured funding for two preceptors to attend the ASHP National Preceptors Conference annually. To identify which preceptors would receive funding, a rubric was created by the subcommittee to aid in the selection process. Preceptors selected to attend the meeting were asked to present a fifteen minute pearls session at a future preceptor development seminar. In order to evaluate the work and impact of the subcommittee, a second needs assessment survey was distributed to preceptors in April 2017.
Results: Since the inception of the Preceptor Development subcommittee, nine seminars on preceptor development have been coordinated at our institution. Eight of these have been Accreditation Council for Pharmacy Education (ACPE)-accredited, one-hour sessions. Four of the seminars were webinars conducted by outside institutions. In these cases, a subcommittee member coordinated live viewing of the webinars. Of note, thirteen of our preceptors were speakers in the various seminars. One hundred and nineteen pharmacists who serve as preceptors for residents and/or students were sent the April 2017 survey. Twenty-six residency preceptors completed the survey who had also completed the initial needs assessment survey in October 2014. The survey showed 96 percent (25/26) of preceptors believed the number of preceptor development programs offered through the department had increased since the inception of the subcommittee. Furthermore, all preceptors (26/26) agreed that these programs enhanced their precepting knowledge, while 96 percent agreed that they enhanced their precepting skills. Four preceptors have received funding to attend the ASHP National Preceptors Conference, which has resulted in four, 15-minute pearls sessions presented to the department. An overwhelming majority of preceptors (96 percent) believed securing funding for preceptors to attend the conference is a good use of pharmacy resources.

Conclusion: The Preceptor Development subcommittee enhanced the number of preceptor development opportunities for preceptors at our institution. In addition, several preceptors served as speakers in a number of the preceptor development seminars, thus allowing them to meet Accreditation Standard 4.8.f by providing preceptor development topics at the site. Future topics for programs and initiatives will continue to be sought by administering the needs assessment survey every two years.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-127

Poster Title: Implementation of an interprofessional education (IPE) assessment tool during introductory pharmacy practice experiences (IPPEs)

Primary Author: Kara Bonaceto, MCPHS University; Email: kara.bonaceto@mcphs.edu

Additional Author(s):
Gretchen Jehle
Nicole Carace
Catherine Basile

Purpose: Providing PharmD students with the opportunity to participate as interprofessional team members and learn about roles of interprofessional team members during IPPE rotations is an important introduction to team based care. These early experiences help prepare students to be contributing interprofessional team members during the Advanced Pharmacy Practice Experiences (APPES). Development of an assessment tool to document the IPPE students’ contributions to the interprofessional team on both community and institutional rotations provides a method to capture introductory team based experiences and provides insight into the IPPE students’ interactions with healthcare team members in community and institutional practice settings.

Methods: IPPE students at our university complete (1) four week community rotation and (1) four week institutional rotation. Students must successfully complete 160 hours on each IPPE rotation. Students are encouraged to document a minimum of (1) interprofessional experience occurring on each IPPE rotation. To ensure documentation of these encounters in a consistent manner, an interprofessional education field encounter was created in our experiential software. The field encounter allows students to reflect upon the Interprofessional Education Collaborative’s (IPEC) competencies: Values/Ethics, Teams/Teamwork, Interprofessional Communication, and Roles and Responsibilities. A dropdown menu of practitioners (including prescribers and non-prescribers) as well as students of various healthcare disciplines was created. Standard 11 of Accreditation Council for Pharmacy Education (ACPE) Standards 2016 describes Interprofessional Education and the corresponding expectations for students, including interactions with prescribers/student prescribers. When an IPE Field Encounter is completed by a student, the preceptor receives an automatic notification by email that the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
encounter can be viewed in the experiential software by clicking on an email link. Preceptors are then able to provide the student with feedback, and confirm or deny the submission.

**Results:** Three hundred and seventeen students completed community and institutional IPPE rotations during the fall of 2016. There were a total of (300) completed Community IPE field encounters and (292) completed Institutional IPE field encounters. Field encounters documented interactions with prescribers (physicians, nurse practitioners, physician assistants, and dentists), non-prescribers (nurses, dietitians, medical assistants, physical therapists, optometrists, psychologists, social workers, and dental hygienists) and students of these disciplines. Students could document interactions with multiple healthcare prescribers and/or non-prescribers per field encounter. Ninety-five percent and ninety-two percent of students successfully completed a community and institutional field encounter, respectively. During the Institutional IPPE rotation, 64 percent of completed field encounters documented an interaction with nursing as compared to 37 percent during the Community IPPE. Other differences included documented interactions with: dietitians (16.1 percent) institutional IPPE vs (2.3 percent) community IPPE, physical therapists (11.3 percent) institutional IPPE vs. (3.3 percent) community IPPE, social workers (12.3 percent) institutional IPPE vs. (3 percent) community IPPE. Two hundred twenty-one of 292 (75.7 percent) field encounters completed during institutional IPPEs documented interactions with prescribers or student prescribers. Two hundred fifty out of 300 field encounters (83.3 percent) documented interactions with prescribers or student prescribers during the community IPPE.

**Conclusion:** IPPE rotations offer students numerous and varied opportunities to interact with healthcare team members. IPPE rotations provide students with a foundational knowledge of interprofessional communication, values/ethics, teams, and roles and responsibilities. The interprofessional education field encounter provides a mechanism for students to reflect upon these experiences, as well as document the many healthcare providers and students with whom they interact during the early practice experiences.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-128

Poster Title: A unique, interactive approach to pharmacy education

Primary Author: Jennifer Brandt, MedStar Washington Hospital Center; Email: jennifer.l.brandt@medstar.net

Additional Author (s):
Margaret Breakenridge

Purpose: Continuous professional development is a necessary component of pharmacy practice. It allows for pharmacists to stay current with information that pertains to their everyday work. However, adult learners learn in a different manner that the traditional lecture. According to the principles of andragogy, adult learning is fundamentally social and requires active engagement. Additionally, education should be problem focused and pertinent to learner. These concepts have been incorporated into a weekly interactive session at a large, tertiary care hospital.

Methods: Once a week, the pharmacists are encouraged to attend the session, called Drug Information Rounds. The session, facilitated by the Drug Information staff, is uses an interactive approach to discuss a variety of pertinent topics. Although all pharmacists may attend, the discussions are designed for the junior staff in a way that encourages participation and instills confidence in their ability to do their job.

Results: Drug Information Rounds has been conducted at the institution for more than 30 years. Topics vary and may include interesting questions that have come through the Drug Information Center, interesting cases, or a review of a topic for which a deficiency was identified. Additionally, once a month, the actions taken by the P&T Committee are discussed in depth so that the staff can understand the rationale and have a chance to ask questions. Regardless of the topic, discussions incorporate basic concepts, like pathophysiology, therapeutics, pharmacoconomics, and even politics. Sessions are informal and held around a conference table with snacks provided. All junior staff, residents, and students are encouraged to attend, as staffing permits. Each rounds starts with individual introductions and a “Question of the Day” to encourage the staff to get to know each other. Although the Drug Information staff help to provide the background information, attendees are encouraged to participate.
through probing, open-ended questions designed to make the attendees think critically. Participants are encouraged to ask questions of their own if they do not understand.

Conclusion: Drug Information Rounds has been a successful approach to education at a large, tertiary care hospital. It helps participants to better understand hospital initiatives, while helping to review basic building blocks of practice. Through its interactive style, Drug Information Rounds fosters professional growth in pharmacists, allowing the department to deliver a high quality of care.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-129

Poster Title: Assessment and perceived benefit of an approved notecard cheat-sheet on a cumulative final examination

Primary Author: Patsy Casalino, MCPHS University; Email: patsycasalino@gmail.com

Additional Author(s):
Thomas Laudone
Erika Felix-Getzik
David Schnee

Purpose: The Accreditation Council for Pharmacy Education encourages continued improvement of professional programs leading to the Doctor of Pharmacy (PharmD) degree. One standard, “The Approach to Practice and Care,” includes the PharmD candidates’ ability to critically think when solving problems relating to current knowledge and practice. This study was designed to examine pharmacy students’ decision making when constructing an approved notecard cheat-sheet and assess the students perception of how this may enhance performance when taking a cumulative final examination.

Methods: A survey was administered to P2 PharmD students prior to completion of a cumulative final examination in a large therapeutics course which assessed the content each student included on his or her notecard/cheat sheet. Based on their responses, students were grouped into three cohorts: students who chose to include “new material” on their notecard, students who chose to include “cumulative material” on their notecard, and students who included information from all four examinations. The survey also assessed if the student had previous experience with use of a notecard on an exam, the perceived benefit of the notecard, how the creation of a notecard altered study habits, and how each student felt they would rely on the notecard during the exam. A survey was then administered following completion of the cumulative examination to assess the impact their choice of content included on the notecard had on their individual performance and how much each student actually relied on the notecard during the exam. The survey answer options included free response questions, yes/no questions, and questions on a Likert scale. Course coordinators did not influence what content was to be included on notecards but rather only restricted that the note card be hand written on a 4 by 6 index card.
Results: Two hundred and ninety three students completed both the pre- and post-exam survey. Twenty-nine of 293 students (9.8 percent) who previously used a notecard during an examination were excluded. Interestingly, based on post-survey results, students using a notecard for the first time relied on their notecard less than anticipated during the exam, with 87 percent reporting that they “already knew/memorized” the material from the actual creation of the notecard itself. Additionally, 65 percent of students surveyed felt the notecard “increased understanding” of the topics covered. The vast majority of students chose to include either only “new material” or “all material” on their notecard. Of these students, approximately 25 percent reported the notecard had no effect or negatively impacted their performance. While evaluating all cohorts, approximately 37 percent of all surveyed students reported the use of a notecard had no effect or negatively impacted their performance. Additionally, 58 percent of the students surveyed felt they performed better on previous exams where use of a notecard was not allowed. Of note, the previous three exams throughout the course were not cumulative.

Conclusion: This study shows that the actual creation of a notecard/cheat-sheet leads to decreased dependence on the notecard during a cumulative final examination. Based on these results, there is further implication that creating the notecard as a study tool likely has more benefit than using the notecard as an exam aid. Ultimately, this study shows that students who utilized a notecard demonstrated better understanding of the information included. Therefore, the practice of creating a notecard/cheat-sheet may be a potential option for use during a cumulative examination.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-130

Poster Title: Effect of a postgraduate training elective on pharmacy students’ knowledge, confidence and success in the residency process

Primary Author: Jacob Gettig, Midwestern University Chicago College of Pharmacy; Email: jgetti@midwestern.edu

Additional Author(s):
Milena McLaughlin
Marzena Socha

Purpose: As the pharmacy profession increasingly progresses toward clinical roles, colleges of pharmacy are recognizing the need to prepare students to successfully secure postgraduate training positions. Our college provides an elective course on pharmacists' postgraduate training opportunities to present information on the application, interview, and match processes for various career paths with a focus on residency opportunities. This study aimed to examine third professional year students’ change in perceived level of knowledge and confidence in skills regarding the residency application process and differences in residency application, interview, and match metrics between students who completed the course versus those who did not.

Methods: This study was exempted from full review by the Midwestern University IRB. Invitations to participate in surveys were emailed to three Midwestern University Chicago College of Pharmacy class cohorts, the Classes of 2015, 2016, and 2017. Electronic surveys were administered at three time points: the first week of the elective (T1), immediately after completion of the elective (T2), and after the residency match process (T3) with at least two reminder emails sent after each timepoint. Surveys were anonymous and voluntary. All surveys included 11 items that assessed GPA and experiences that may have affected confidence or success with the residency application and match process, and 10 Likert-style items that assessed self-perceptions of knowledge about residency topics and confidence in residency application and interviewing skills. The T1 and T2 surveys included two items which assessed students’ likelihood of pursuing residency training and confidence in matching to a residency. The T3 survey included 10 items that assessed students’ decisions and successes regarding the residency application, interviewing and matching process. The target sample were students who had taken the elective in their third professional year (E) and students who never took the
elective (NE). Data were analyzed using descriptive statistics, and intragroup and intergroup statistical comparisons were conducted, as appropriate.

**Results:** Overall response rates for T1, T2, and T3 surveys were 27 percent (87/326, 45 E, 42 NE), 14 percent (47/326; 25 E, 22 NE), 25 percent (83/326; 31 E, 52 NE), respectively. Baseline (T1) characteristics between E and NE cohorts were generally similar. Paired comparisons of items about perceived knowledge and skills used in the residency application process of T1 and T2 responses showed statistically higher scores in 7/10 items and 1/10 items for the E (n equals 11) and NE (n equals 13) cohorts, respectively. At T2, the E cohort (n equals 23) was significantly more likely (p equals 0.004) to pursue residency training than the NE cohort (n equals 22); however, there were no significant differences in the cohorts’ confidence in matching to a program (p equals 0.206). At T3, between-group responses revealed significantly higher student organization involvement, perceived knowledge about the residency match process and perceived confidence in skills associated with writing a letter of intent and interviewing in the E cohort (n equals 22) vs. the NE cohort (n equals 32); however, there were no between-cohort differences regarding number of applications submitted, number of interviews offered, or match success.

**Conclusion:** Third professional year pharmacy students who completed an elective residency preparation course appeared to have higher perceived level of knowledge and skills related to the residency application process than students who did not take the elective. In addition, perceived knowledge about the match and skills writing letters of intent and interviewing remained higher around the end of the fourth professional year for students who had taken the elective. However, completing the elective did not appear to have any significant effect on differences in the number of applications submitted, interviews offered or match success.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-131

Poster Title: Assessing health science students' knowledge and awareness of human trafficking

Primary Author: Brooke Havlat, Creighton University School of Pharmacy and Health Professions; Email: bdh86341@creighton.edu

Additional Author(s):
Ann Ryan Haddad
Yongyue Qi

Purpose: Recent studies indicate 28 to 50 percent of human trafficking victims in the United States have encountered a health care professional while in captivity without being recognized or identified. Health care professionals have the potential to recognize signs of human trafficking within emergency departments, community health centers, migrant and refugee care centers, adolescent health care centers, and other care environments. This project was designed to evaluate the current awareness of human trafficking by all health science students at a university and determine the need for further education to prepare students for intervention in clinical rotations, community service, and future jobs.

Methods: A pharmacy student at the university conducted a literature search on human trafficking within the United States and attended a local presentation on human trafficking to determine which questions within a survey would best evaluate the current knowledge of health science students on human trafficking. A 15-question survey was sent out twice, within a two-week period, via email invitation and included demographics, current knowledge level of human trafficking, previous training or education, identification of awareness and knowledge of signs and symptoms, and screening questions. The survey was sent to all pharmacy, dental, medical, nursing, occupational therapy, and physical therapy students. The response rate was then calculated and descriptive statistics were performed. Response frequencies and percentages for each question were calculated. To correlate two survey questions, cross tabulations were computed. Chi-Square tests were used to test if there was a relationship between demographic variables and knowledge and awareness of human trafficking variables.

Results: Four hundred sixty-three students completed the survey. Over 50 percent were female and between the age of 22 and 25. Twenty-three percent were nursing students, 22 percent...
were medical students, 16 percent were pharmacy students, with the rest being occupational therapy, physical therapy, and dental students. There were no associations between gender and knowledge, exposure, likelihood of identifying victims, or awareness of human trafficking. Undergraduate nursing students were found to be more likely to have significant or some exposure to human trafficking coursework while dental students had the least exposure (P < 0.001). Pharmacy students had the second least amount of exposure. Medical students and undergraduate nursing students were the most familiar with the signs that could identify a human trafficking victim while dental students were the least familiar (P=0.004). Pharmacy students were the second least familiar. Undergraduate nursing students, medical students, and graduate nursing students were more likely to be aware of the National Human Trafficking Hotline while dental students were least aware (P < 0.001). Pharmacy students were the second least aware. Students who had some or significant exposure to coursework were more likely to be familiar with signs and symptoms of human trafficking (P < 0.001).

**Conclusion:** Dental and pharmacy students appear to have the least amount of exposure to human trafficking coursework or education. All health science students have the potential to encounter human trafficking victims within various health care settings, including dental clinics and pharmacies, leading to the obligation to ensure all students have the same level of knowledge. Further evaluation needs to be conducted to confirm the necessity of implementation of a required online module or presentation for all health science students at the university.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-132

Poster Title: Evaluating the impact of creating an approved notecard cheat-sheet on preparation time and stress levels related to a cumulative final examination in a therapeutics course

Primary Author: Thomas Laudone, MCPHS University; Email: tlaudone@msn.com

Additional Author(s):
Patsy Casalino
Erika Felix-Getzik
David Schnee

Purpose: To assess the impact that an approved notecard cheat-sheet has on P2 Pharm D students’ preparation time and stress levels in relation to a cumulative final exam in a large therapeutics course at an ACPE accredited institution.

Methods: Pre and post final exam surveys consisting of 17 and 18 questions respectively were administered to P2 PharmD students in a large therapeutics course to establish their perceived degree of change in preparation and exam related stress levels. This study was submitted to and approved by the appropriate institutional review board. The survey question types included yes/no questions, ranking responses, and free response. A sampling of the questions included: “approximately how many hours did you spend creating your notecard?”, “how has the thought of using a notecard affected your stress and anxiety level leading up to the exam?”, “how did the notecard affect your stress and anxiety level during the exam?”, and “knowing that a notecard was allowed on the final exam, did you alter your typical study habits for the final exam?”. There was, also, a follow-up free response question asking the students to describe how their study habits specifically changed. The course coordinators did not have any restrictions on the content, but the cheat sheets were restricted to a handwritten, “4X6” notecard.

Results: Two-hundred and ninety-three students responded to the pretest survey that focused on the perception of how the use of the notecard cheat-sheet would affect their preparation time prior to the exam and stress levels related to the exam. Of the students that gave a numerical response, 191 (65 percent) of students reported that the average time spent making the notecard cheat-sheet was 7 hours. Leading up to the exam, 234 (80 percent) of the students

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
felt that they had decreased exam related stress levels with the use of a note card cheat sheet. When looking at preparation for the exam, 147 (50 percent) students changed their study methods and then provided specific written examples of how their study techniques were altered. In the free response section of the survey pre-test, 54 (18 percent) of the 293 students decided to solely describe how they had decreased stress levels knowing that they would have a note card during the exam. In the post test survey, 205 (70 percent) of students reported they had decreased stress levels during the exam, and sequentially, 117 (40 percent) of students stated there was no change in the time it took them to complete the exam.

**Conclusion:** These results correlate with the notion that students who are able to create and utilize a notecard cheat-sheet on a cumulative final exam experience decreased exam related stress levels. Additionally, the creation of a notecard cheat-sheet may have positive effects with regard to how students utilize their time preparing for a cumulative exam.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-133

Poster Title: Impact of an interprofessional patient safety simulation on student perceptions of interprofessional education

Primary Author: Paige Meade, Creighton University School of Pharmacy & Health Professions; Email: pkm02997@creighton.edu

Additional Author(s):
Summer Rhodes
Rhianna Gullickson
Samantha Haugaard
Katie Packard

Purpose: Increasing rates of medical errors necessitate incorporation of patient safety education and development of interprofessional communication and teamwork for health professional students. Team-based care shows potential to reduce errors and improve patient safety, quality of care, and communication. The purpose of this study was to evaluate healthcare student perceptions of interprofessional education (IPE) through a team-based learning exercise. A patient safety competition was created by pharmacy students in 2016 to train students from Dentistry, Emergency Medical Services, Medicine, Nursing, Occupational Therapy, Pharmacy, and Physical Therapy on interprofessional teamwork and communication through recognition of patient safety hazards.

Methods: This study was reviewed by Creighton University’s IRB and deemed exempt. The activity was adapted from T3 Train-the-Trainer Interprofessional Faculty Development Program at the University of Missouri Columbia. Thirty-six health professional students, both campus and distance, in nine teams participated. Students completed a pre-survey utilizing the Student Perceptions of Interprofessional Clinical Education-Revised (SPICE-R) instrument. Demographics obtained included participants’ disciplines, gender, learning pathway, and year in curriculum. Teams were guided through the simulated hospital room in the nursing school simulation lab by room facilitators. Students observed a patient's hospital room and were asked to identify hazards that could potentially lead to harm. Distance students simultaneously viewed a recording of the simulation while campus students were viewing the room on site. A debriefing occurred in a designated room where faculty reviewed the safety hazards present in the room. Distance students teleconferenced during the simulation and debriefing sessions. A post-survey

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
was completed after the activity including the SPICE-R plus six additional questions to gauge the overall success of the exercise. Data from the pre- and post- surveys were analyzed to determine mean change between the SPICE-R scores using a paired students’ t-test.

**Results:** Of 36 participating students, 30 completed pre- and post-surveys. Teams ranged in number from three to five members, and contained between two and three disciplines per team. Team composite scores ranged from 16 to 28 out of a total a 70 possible points (errors). Groups containing 3-4 members had a mean score of 20.57 plus or minus 3.10, which was significantly lower than that of teams containing 5 members, who scored 27.00 plus or minus 1.41 (p value equaling 0.029). SPICE-R scores significantly improved from 45.35 plus or minus 2.91 to 46.86 plus or minus 2.91 (p value less than 0.0001).

**Conclusion:** This unique simulation activity provided students with an interprofessional collaboration opportunity that significantly improved students’ perceptions of IPE. The data show a positive relationship between number of disciplines per team and greater success at finding errors. Accreditation agencies for all health science programs require IPE and collaboration among health professions students. Institutions can implement this innovative method, which incorporates both campus and distance pathway students, to meet IPE requirements. Future research includes the comparison of composite scores and number of disciplines per team, and/or assessing the severity of hazards identified by teams.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-134

Poster Title: Comparing the effect of live attendance versus video capture viewing on student exam performance

Primary Author: Jenny Mullakary, MCPHS University - Boston; Email: jmull1@stu.mcphs.edu

Additional Author(s):
Tucker Ward
Eli Philips
Stefanos Torkos
David Schnee

Purpose: The adoption of video capture continues to result in decreased live lecture attendance and has led many to question the benefits of this technology. The resulting drop in attendance has concerned many instructors and administrators of higher education due to the hypothesis that skipping lecture decreases student exam performance. The purpose of this study was to test this hypothesis by comparing student performance based on live attendance versus video capture use in a cohort of P2 pharmacy students.

Methods: Attendance was taken randomly during seven lectures in a large Therapeutics course over the duration of one semester. The number of times each student viewed the online lectures utilizing Echo360 video capture software was extracted from the system’s database. The performance of each student on the specific set of exam questions pertaining to each of the seven lectures was matched with each students' attendance of that lecture as well as the correlating video capture views. Student data was then de-identified for data analysis. Analysis consisted of calculating the student's' performance on the specified questions, and then the cohort was sorted by attendance. The 6 groups compared were all students who attended class, all students absent from class, students who attended class and watched the recorded lecture online, students who attended class and did not watch the recorded lecture online, students absent from class and watched the recorded lecture online and students absent from class and did not watch the recorded lecture online. A pivot table was used with the data for each lecture as well as the combined set of data in order to obtain the average performance of each of the six groups.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Results: There was a total of 353 students evaluated over 7 lectures, which correlated to a total of 2,430 data points. There were 1,792 students overall present for the lectures, of which these students achieved an average of 70.43% on the respective exam questions. This is compared to the 638 absent students who achieved an average of 63.96%. When comparing the cohort that was present, the 548 students who utilized video capture achieved an average of 69.20% compared to the 1,244 students who did not utilize video capture and achieved an average of 71.02%. Among the students absent from class, the 278 students who utilized video capture only once achieved an average of 62.28%, the 440 students who utilized video capture at least once achieved an average of 64.1%, and the 198 students who did not utilize video capture achieved an average of 63.66%.

Conclusion: In a large therapeutics course of P2 pharmacy students, performance was analyzed based on lecture viewing behavior. The students who attended lecture performed better on average than those who did not. The best performing group of students were those that attended lecture and did not utilize recorded video capture, supporting the idea that in this changing landscape of using technology in the classroom, attendance leads to higher overall student performance.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-135

Poster Title: Implementation of a preceptor development plan to achieve accreditation standards for a postgraduate year one (PGY1) pharmacy residency program

Primary Author: Hien Nguyen, AtlantiCare Regional Medical Center; Email: hient.nguyen@atlanticare.org

Additional Author (s):
Dominique Fields
Ethan Nhan
Sandra Garrett
Joseph Reilly

Purpose: The postgraduate year one (PGY1) pharmacy residency program at Atlanticare Regional Medical Center (ARMC) was surveyed and accredited by the American Society of Health-System Pharmacists (ASHP) in 2013 for a three-year period. The surveyors cited the program for partial compliance related to preceptor qualifications and their record of contributions and commitment to pharmacy practice. Our Residency Advisory Committee (RAC) addressed the issues concerning preceptor qualifications and initiated a development plan. The purpose of developing this plan was to provide preceptors with a strategy to meet the requirements of the preceptor criteria outlined in the accreditation standards.

Methods: A three-year plan was initiated in 2013 to enhance the pharmacy residency program by advocating for professional growth of the preceptors and achieving compliance with the 2016 reaccreditation survey. Each preceptor’s curriculum vitae was reviewed by members of RAC for enhancement opportunities with a development plan created for each preceptor. The development plans were designed to encourage preceptor participation and professional contributions. Areas for preceptor participation were identified as professional organization membership, meeting attendance, research poster presentations, editorial appointments to journals, adjunct faculty opportunities, as well as board and specialty certifications. Areas for professional contributions included publications and research citations. Pharmacy leadership encouraged and provided full support and funding necessary for preceptor development. Our RAC created the Preceptor Growth Events (PGE) value that provides an objective measure of the extent of preceptor development each year. The PGE value is calculated by multiplying the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
number of preceptors by the number of preceptor participation events or professional contribution events per year.

**Results:** The implementation of the preceptor development plans resulted in approximately an 8-fold increase in both preceptor participation (4 to 46 events per year) and professional contributions (4 to 45 events per year). This resulted in a PGE increase by 13-fold (40 to 552) and 16-fold (32 to 540) for preceptor participation and professional contributions, respectively. The preceptor developmental plan and the PGE values provided the supporting evidence needed to meet the preceptor criteria for ASHP accreditation standards. The PGY1 pharmacy residency program expanded from 2 to 3 residents and increased the number of qualified preceptors from 8 to 12.

**Conclusion:** The preceptor development plan was an effective strategy to satisfy ASHP standards and bridge the gap to attain compliance. The PGY1 pharmacy residency program was fully compliant with meeting the preceptor criteria according to the 2016 ASHP survey and was granted full accreditation for maximum allowable period. Administrative support and encouragement for professional growth and engagement has produced significant contributions in quality and growth of the PGY1 pharmacy residency program.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-136

Poster Title: Impact of a residency program design and conduct workshop on regional residency programs

Primary Author: Lisa Richter, Sanford Medical Center Fargo; Email: lisa.richter@sanfordhealth.org

Additional Author(s):
Amber Olek
Maari Loy

Purpose: In 2016 nearly 1,800 pharmacy residency applicants remained unmatched after both phases of the match. A strategic goal of the state society was to facilitate completion of the Pharmacy Advancement Initiative (PAI) Hospital Self Assessment (HSA). State trends revealed questions regarding residency training to be answered with high impact, no resources/no feasibility demonstrating a common need. In an effort to address this objective of the PAI, a regional residency program design and conduct (RPDC) workshop was held. This project details results of a pre/post assessment related to residency program development after a state affiliate coordinated ASHP RPDC workshop.

Methods: A survey was distributed to the 79 attendees from 23 programs in four states at the RPDC workshop. Attendees were instructed to fill out the surveys at the beginning of the workshop. A seven question five point Likert scale was used pertaining to program structure and accreditation. Additional multiple choice demographic questions were included as well as multiple choice questions pertaining to goals for residency program expansion or initiation and barriers to achieve these. After the eight hour workshop, attendees were instructed to fill out the second half of the survey which contained the same seven Likert questions as the pre-survey, the option to be included in follow up residency program networking meetings and a free form question related to any support the state affiliate could provide related to expansion of residency programs in our region. Due to the need to be able to contact participants for the follow up meetings, anonymity was optional within the survey.

Results: All 23 programs had at least one attendee return a survey. The total attendee response rate was 63% (50/79 attendees). Questions including: I am able to identify the purpose and competency areas for a PGY1 residency and related accreditation requirements; I can describe...
accreditation requirements for PGY1 residency program structure and orientation; and describing accreditation requirements for learning experiences and learning activities is something I am comfortable doing moved the median from neutral (3) pre-survey to agree (4) post-survey. Additionally, the question: I can identify the most appropriate preceptor role to use with a resident went from a median of agree (4) pre-survey to strongly agree (5) post-survey. The most common barrier to increasing residency position identified by attendees was funding (24 attendees) followed by adequate preceptor training (14 attendees). These specific barrier topics were then discussed in further detail in follow up every other month web conference residency networking meetings and ideas for additional resources and group discussions of ways to overcome perceived barriers were provided at that time.

**Conclusion:** A state affiliate coordinated RPDC workshop increased the knowledge and helped empower regional programs to start the process of increasing residency positions. Follow up meetings were held to continue the work started at the workshop and focus on areas identified as barriers by attendees.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-137

Poster Title: Objective structured clinical examination in a first-year nonprescription medication course for an accelerated three-year pharmacy program

Primary Author: Jordan Sedlacek, Larkin University College of Pharmacy; Email: jsedlacek@ularkin.org

Additional Author(s):
Andria Church

Purpose: Many pharmacy education programs have reported using objective structured clinical examinations (OSCEs). Mock patient scenarios have been shown to improve students’ skills, knowledge, and confidence, but development of OSCEs is not standardized across pharmacy schools. Furthermore, while a study has been published on second- and third-year students participating in OSCEs during a nonprescription medication class, there are no studies focusing on first-year pharmacy students in a similar course. The goals of this study are to determine if OSCE scores have a correlation with assessment scores and to analyze if a systematic OSCE development technique would decrease intergrader variability.

Methods: The following describes the six systematic steps of OSCE development: 1) developed rubrics for grading of student performance, 2) developed five OSCE cases as a group of two clinical faculty members, 3) three content experts analyzed the cases as a group discussion, 4) cases were revised based on expert analysis, 5) faculty graders were given orientation to the cases. During the orientation, faculty were asked to watch two video examples and grade the video examples based on the rubric. After grading this rubric, feedback was given to the evaluators to ensure consistency with grading, 6) faculty patients were also given orientation and had the opportunity to watch patient simulation videos. Next, the students participated in OSCE day as a required nonprescription medication course formative assessment. The next day, the students participated in the required course summative assessment. In the retrospective analysis of the data, the investigators compared final assessment scores (as a percentage) to OSCE scores (as a percentage), and analyzed if there was a difference between faculty evaluators and OSCE scores.

Results: The ranges for OSCE and summative course assessments were 40.9-95.5% and 55.3-94.7%, respectively. The average score on the OSCE assessment was 72.3% and the average
score on the summative course assessment was 80.9%. There was a weak positive correlation between the OSCE and summative assessment scores, which was statistically significant (p=0.006). The OSCE scores between evaluators did not demonstrate a statistically significant difference.

**Conclusion:** OSCE scores demonstrated a weak correlation to course assessment scores. Therefore, OSCEs can potentially predict student success on end of course examinations. By providing an evaluator training prior to the OSCE, investigators concluded there was no significant differences between evaluator scores. Overall, the significance of this data should be further validated in a larger study.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Professionalism And Career Development

Session-Board Number: 7-138

Poster Title: Retrospective assessment of time allocation and impact on postgraduate outcomes in a graduating class of P4 pharmacy students

Primary Author: Tucker Ward, MCPHS University; Email: tuckerward25@gmail.com

Additional Author(s):
Jenny Mullakary
David Schnee
Erika Felix-Getzik

Purpose: Recently, there has been an increased interest in pursuing postgraduate opportunities in residency and fellowship among pharmacy students. This has increased the competition for these limited positions and has led many students to diversify their time and efforts during pharmacy school outside of the traditional didactic coursework. The goal of this study was to measure how and where students allocated their time across various modalities during pharmacy school and if there was a direct correlation in obtaining a postgraduate position.

Methods: Graduating pharmacy students at a single institution were given the opportunity to participate in this survey during their NAPLEX preparation review. This anonymous survey, composed of 38 questions, measured each student’s time allocation among various activities including extracurriculars, studying, paid work, research, and class attendance throughout the P1 through P4 years. The survey also measured application and acceptance rates for postgraduate training programs, including residency and fellowships, as well as entry level pharmacy positions. Overall, student data was divided into 3 groups: those that attained a postgraduate training position, those that attained an entry-level pharmacist position, and those that did not earn a position. Additional analysis was performed using the same grouping process for those students who applied for residency and fellowship programs to determine if there was a link between achievement of these positions based on level of activity throughout the professional years. Trends in the data were assessed between each group to evaluate any correlations that may have occurred. A Time Allocation Score was developed in order to measure how students allocated their time for various activities throughout their P1 through P4 years. Students received 0, 1, or 2 points based on the time allocated to each activity. A total score was calculated for each student which categorized them into High (21-32), Medium (11-21) and Low (0-10) involvement groups.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Results:** A total of 230 graduating PharmD students completed this survey. One hundred one students applied for postgraduate training (41 students applied for fellowships and 60 students applied for residency programs). Among the fellowship and residency applicants, 41 were placed into a training position (13 attained fellowships and 28 attained residencies). Of those who successfully attained postgraduate training, 7 (17.07%) were categorized as low involvement, 28 (68.29%) were categorized as medium involvement, and 6 (14.63%) were categorized as high involvement based on the Time Allocation Score. Of those who didn’t attain postgraduate training, 26 (43.33%) were categorized as low involvement, 27 (45.00%) were categorized as medium involvement, and 7 (11.67%) were categorized as high involvement based on the Time Allocation Score. Compared to the students who were offered a postgraduate training position, the Time Allocation Score had no impact on entry level job offers. However, of the students who attained entry level positions, 79% worked five or more hours per week in their P3 year whereas only 59% of those who didn’t attain an entry level position worked five or more hours per week in their P3 year.

**Conclusion:** This study suggests that students who have at least a medium level of involvement during pharmacy school have an increased chance for attaining postgraduate training. Greater rates of involvement in areas including leadership positions, professional organizations, and research were observed in the students that successfully attained a postgraduate training position. Level of involvement did not appear to impact the outcomes of students who applied for entry level positions. A greater number of hours worked per week, however, were observed in the group of students who successfully attained a position compared to those who did not.
Submission Category: Professionalism And Career Development

Session-Board Number: 7-139

Poster Title: A pharmacy advocacy and leadership elective in pharmacy education

Primary Author: Kristine Willett, MCPHS University; Email: kristine.willett@mcphs.edu

Additional Author(s):
Cheryl Durand

Purpose: Pharmacists, pharmacy technician, and pharmacy student practice roles continue to expand. With these practice advancements requires the development of both leadership and advocacy skills in doctor of pharmacy students. Early exposure of these topics will inspire students to continue to develop their leadership skills and enhance their involvement in professional advocacy issues. Our current pharmacy curriculum allows limited coverage of these topics.

Methods: A ten-week elective course was developed to expose first year pharmacy students to topics including leadership skills and development, government affairs and the legislative process, communicating with legislators, the role of national and local pharmacy organizations, various hot topics in pharmacy practice, policy development, and the role of State Boards of Pharmacy. Experiences were assessed using weekly student reflections.

Results: Seventy-five students over the last 5 years have enrolled in a pharmacy advocacy and leadership elective course during their first professional year. Students were exposed to variety of current pharmacy topics, including changes in sterile compounding regulation, opioid crisis, and changes to local laws. Students were also given the opportunity to participate in a number of hands on activities including a mock public hearing at the State Board of Pharmacy, a visit to the State House with local legislators or debate topics such as the Accountable Care Act and pharmacy role in lethal injection and in prescribing oral contraceptives. Further, students were given practical advice from members of the State Legislature that present important points about communicating with members of Congress and Senate. Student reported positive feedback on these experiences and an increased desire to get involved in the advocacy of their profession.

Conclusion: The valuable experiences and topics introduced during this elective course promotes leadership development in pharmacy students. Student feedback suggest that early

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
introduction of the value of pharmacy advocacy has improved student confidence in their role in government affairs and the legislative process.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Professionalism And Career Development

**Session-Board Number:** 7-140

**Poster Title:** Effect of a multi-modal learning experience on pharmacy residents’ knowledge and confidence towards research and biostatistics

**Primary Author:** Breann Williams, Mayo Clinic; **Email:** williams.breann@mayo.edu

**Additional Author(s):**
Jason Barreto  
Alexander Heyliger  
Shannon Piche  
Erin Frazee

**Purpose:** The optimal method to provide research education to pharmacy residents is unknown. The purpose of this study was to evaluate the impact of a combined didactic and interactive structured research curriculum on pharmacy residents’ confidence and knowledge.

**Methods:** This self-administered, web-based, pre-post study surveyed pharmacy residents from the Mayo Clinic Health System during the 2016 to 2017 academic year. All respondents provided consent for research participation. At the study center, residents undergo a structured research curriculum which includes a two-day interactive workshop and web-based online learning modules and assessments through our NIH Center for Clinical and Translational Science. Participants were asked to complete a baseline 48 question survey before beginning the research curriculum, which covered 3 domains: research confidence, attitudes, and knowledge. The survey instrument included items from previously validated assessment tools. In the domains of confidence and attitude, responses used levels of agreement based on a Likert scale. Knowledge items had one best answer. The survey was then again repeated within 60 days of residency graduation after all education was completed. Before and after data were summarized using descriptive statistics reported as a mean plus or minus standard deviation (SD).

**Results:** Eleven (73 percent) residents out of 15 eligible provided complete baseline and follow-up responses for at least one of the survey domains. The majority of respondents were post graduate year 1 (PGY1) residents (8; 73 percent) and six (55 percent) respondents reported previous formal research training. Eleven residents completed the baseline and follow-up questionnaire items pertaining to confidence and attitude. Overall, 3 (27 percent) residents

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
reported that they were at least somewhat confident in their biostatistics and clinical research skills at the beginning of residency compared to 10 (91 percent) residents after completion of formal education. The pattern in self-reported confidence before and after the research training was consistent across levels of training (PGY1: 25 percent at least somewhat confident before, 86 percent after; PGY2: 33 percent at least somewhat confident before, 100 percent after). Among the 8 individuals with complete before/after responses to the 28 items in the knowledge domain, the mean score was 15 plus or minus 2.5 SD correct. After education, the mean score was 20 plus or minus 2.7 SD correct. The mean intra-individual improvement in knowledge scores was 5 plus or minus 3.1 SD (18 percent improvement).

**Conclusion:** This study demonstrates that a structured curriculum which combines didactic and interactive structured learning can have a positive impact on the confidence and knowledge of pharmacy residents. Further research should evaluate long-term knowledge and confidence and compare the curriculum provided at Mayo Clinic to other institutions to determine optimal method of providing research education.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Psychiatry / Neurology

Session-Board Number: 7-141

Poster Title: Evaluation of the risk factors and management of depression in the Lebanese population

Primary Author: Riwa Al Aridi, Lebanese International University; Email: 11231376@students.liu.edu.lb

Additional Author(s):
Sarah Dakroub
Michelle Cherfan
Marwan Akel
Jihan Safwan Saade

Purpose: Depression is one of the most common neurological disorders encountered in clinical practice. The most common risk factors are stressful experiences, isolation, marital problems, and economic strains. Treatment usually aims to reduce symptoms and improve quality of life. The aim of this study is to evaluate the risk factors associated with depression along with the pharmacotherapeutic management used in the Lebanese population.

Methods: Clinical pharmacists in a community setting conducted a multi-center observational study between October 2016 and May 2017. The institutional review board of the school of pharmacy at the Lebanese International University reviewed and approved the study protocol. The researchers obtained an oral informed consent before filling a cross sectional survey for patients who were presenting to pharmacies across different regions in Lebanon to purchase an antidepressant medication. Excluded cases were non-Lebanese and hospitalized patients. They filled data about the participants' demographics, co-morbidities, risk factors, and pharmacotherapeutic management. All statistical analysis was performed using SPSS version 23.0 and presented as frequency, percentage, means, and standard deviations. A Pearson chi square p-value of less than 0.05 was considered to indicate statistical significance and binary logistic regression identified risk factors that were associated with an increased risk of depression.

Results: A cross-sectional survey was analyzed based on 1000 patients who were depressed with an average age of 50.12 years with a standard deviation of 17.304. The collected data showed that 56.2% were females, 56.4% were smokers, and 47.9% were university educated.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Participants were treated non-pharmacologically (30%) through relaxing activities (17.3%), exercise (15.7%), psychotherapy (12.3%), and cognitive behavioral therapy (5.7%), whereas pharmacological treatment was reported through selective serotonin reuptake inhibitors (59.9%), serotonin norepinephrine reuptake inhibitors (17.3%), tricyclic antidepressants (14.7%), and atypical antidepressants (8.5%). Unfortunately, counseling was performed by either physicians (78.1%) or pharmacists (19.6%), showing that the latter was less involved in the management of such patients. Pearson chi square analysis showed that the following were associated with depression: pregnancy, smoking, family history of depression, poor social relationship, depression in environment, work problems, close relative loss, low self-esteem, criticism from family member, interferon use, and marital problems. Eventually, a binary logistic regression assured that the following variables were associated with high risk of depression, including: marital problems [Odd’s Ratio (OR), 2.206], family history of depression (OR, 2.023), depression in environment (OR, 1.748), loss of close relative (OR, 1.66), poor social relationship (OR 1.522), and smoking (OR, 1.362).

**Conclusion:** Depression is a multifaceted health issue with many determinants and consequences. This study demonstrates that among Lebanese patients, marital problems and family history of depression were the major contributing factors. Accordingly, creating awareness on mental health may help in developing initiatives to protect and preserve the well-being of such patients in order to reduce suffering, lower incidence of suicide, and prevent economic loss. Moreover, the role of the clinical pharmacist remains crucial in counseling patients about the management of depression especially that their role in Lebanon is still limited.
Submission Category: Psychiatry / Neurology

Session-Board Number: 7-142

Poster Title: Possible auto induction of valproic acid in a patient with bipolar disorder

Primary Author: Stephen Dolley, CompleteRx; Email: steve.dolley@dmh.state.ma.us

Additional Author(s):
Anna Morin

Purpose: Divalproex sodium is an antiepileptic drug that is also approved by the US Food and Drug Administration for the treatment of manic episodes associated with bipolar disorder and prophylaxis of migraine headaches. Following oral administration, divalproex sodium dissociates to valproic acid in the gastrointestinal tract. For the treatment of mania, the recommended starting dose of divalproex sodium is 750mg/day titrated to achieve therapeutic valproic acid trough concentrations between 50-125mcg/mL. The maximum recommended daily dose is 60mg/kg. Valproic acid primarily undergoes hepatic metabolism via glucuronidation that involves uridine diphosphate glucuronosyltransferases and beta-oxidation, with less than three percent of the parent drug eliminated unchanged in the urine. Metabolism of valproic acid is dose and concentration dependent with beta-oxidation as the predominant pathway at low doses and glucuronidation the predominant pathway at therapeutic doses. Metabolism of valproic can be induced when administered concurrently with other antiepileptic agents (e.g., phenytoin, carbamazepine, phenobarbital, primidone). Limited evidence (one study and three case reports) indicates that auto induction, similar to that seen with carbamazepine, can take place with valproic acid although the mechanism is not well understood. One study that evaluated low dose valproic acid (400mg/day in two divided doses) administration in healthy adults (age range: 18-29 years) over a period of twenty-one days found a small increase in valproic acid clearance believed to be via induction in the beta-oxidation pathway. A published case series describe three cases in which valproic acid doses of greater than 4000mg/day were needed to maintain therapeutic concentrations. The authors concluded that genetic variants within these patients may have caused induction of protein synthesis of uridine diphosphate glucuronosyltransferases and resulted in increased metabolism of valproic acid via glucuronidation. This case report describes the possible auto induction of valproic acid in an eighteen year old male residing in a long term care inpatient psychiatric facility with a diagnosis of bipolar disorder, mixed state with psychosis. In May 2016, a divalproex sodium delayed release dose of 500mg at bedtime resulted in a steady state valproic acid concentration of 59.6mcg/mL. At the same dose, a steady state valproic acid level...
drawn in July 2016 resulted in a concentration of 39.0mcg/mL. In October 2016, divalproex sodium delayed release was discontinued for a short period of time, restarted as divalproex sprinkles and later changed to valproic acid liquid. The patient required a series of dose escalations over a four month period, arriving at an eventual valproic acid liquid dose of 1500mg twice daily to achieve and maintain therapeutic valproic acid concentrations. During this time, while taking a dose of 1000mg at bedtime, the steady state valproic acid concentration decreased from 58.7 to 48.3mcg/mL. At a dose of 1000mg twice daily, the steady state valproic acid concentration decreased from 71 to 51.8mcg/mL. Medication acceptance and potential drug interactions did not appear to impact valproic acid concentrations.
Submission Category: Psychiatry / Neurology

Session-Board Number: 7-143

Poster Title: Implementation of a pharmacist-driven protocol for the management of metabolic disorders in psychiatric patients taking scheduled antipsychotic medications at a community based inpatient psychiatric facility

Primary Author: Ryan Heath, Baptist Health Care; Email: heathrp87@gmail.com

Additional Author(s):
Shelby Gaudet
Marie Barnicoat
Rudy Seelmann

Purpose: Metabolic disorders are significant adverse reactions associated with the use of antipsychotic medications. The Centers for Medicare and Medicaid Services recently began requiring inpatient psychiatric facilities to report the percentage of patients who were discharged on scheduled antipsychotic medications that received a comprehensive metabolic screening in the previous 12 months. A review of current practices at Baptist Health Care revealed the potential for an increase in the number of patients found to have metabolic lab abnormalities due to increased screening. The purpose of this study was to determine if a pharmacist-driven protocol could be successfully used to treat these patients.

Methods: This IRB approved study occurred at Baptist Behavioral Medicine Center, a 90-bed free-standing inpatient psychiatric facility that is a part of Baptist Health Care in Pensacola, Florida. A pharmacist-driven protocol for the management of metabolic disorders in psychiatric patients was developed in collaboration with hospitalist physicians and psychiatrists. The protocol was based on practice guidelines, physician preferences, medication costs, medication safety, and medication efficacy. This protocol targeted patients with lipid, triglyceride, or blood glucose lab abnormalities, and allowed clinical pharmacists to initiate specific medications and monitoring parameters for patients who met inclusion criteria. These criteria varied based on the metabolic disorder being treated. The protocol was reviewed and approved by our organizations Performance Review Committee. Candidates for treatment via the protocol were identified by clinical pharmacists during psychiatric clinical rounds, or at any time by a psychiatrist. A pharmacy consult for metabolic disorder management was placed for these patients through a computerized physician order entry system. If a pharmacy consult was received but the patient did not qualify for treatment via the protocol, a hospitalist physician

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
consult was placed by the clinical pharmacist. Retrospective data collection occurred from December 14th, 2016 to June 14th, 2017. The primary outcome of the study was the number of patients who received each type of intervention through the protocol.

**Results:** Twenty-eight patients received pharmacy consults for metabolic disorder management and had at least one intervention implemented. Interventions included initiation of HMG-CoA reductase inhibitor therapy in 19 patients, initiation of fenofibrate therapy in 14 patients, initiation of metformin therapy in one patient, and optimization of home medication regimens for hyperlipidemia and diabetes in one patient. No adverse reactions related to medications initiated through the protocol were documented in the inpatient medical records. The majority of patients with blood glucose abnormalities met exclusion criteria. These patients were therefore treated by a hospitalist physician. A reduction in hospitalist physician workload occurred through prevention of consults for hyperlipidemia and hypertriglyceridemia. The additional workload on clinical pharmacy staff was estimated to be approximately 20 minutes per consult. All hospitalist physicians and psychiatrists involved reported satisfaction with the quality of care the patients received through the protocol.

**Conclusion:** The pharmacist-driven protocol proved to be an effective and efficient means of initiating medication therapies in patients with metabolic disorders secondary to antipsychotic medications. Hospitalist physician utilization was reduced as a result of a pharmacist managed process for addressing metabolic lab abnormalities. Patients were initiated on appropriate therapy, were monitored for adverse reactions and physicians reported satisfaction with the pharmacist-driven protocol. Future direction of the protocol includes review of our current inclusion and exclusion criteria for managing blood glucose abnormalities in efforts to increase pharmacist intervention in this patient population.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
**Submission Category:** Psychiatry / Neurology

**Session-Board Number:** 7-144

**Poster Title:** Safety and pharmacokinetic profile of 2-month aripiprazole lauroxil: phase 1 study and population pharmacokinetic model

**Primary Author:** Roger Sommi, UMKC School of Pharmacy; **Email:** sommir@umkc.edu

**Additional Author (s):**
Angela Wehr
Marjie Hard
Peter Weiden
Lisa von Moltke

**Purpose:** Aripiprazole lauroxil (AL) is an FDA-approved long-acting injectable antipsychotic treatment for schizophrenia. AL is a non-ester prodrug of aripiprazole that results in extended systemic release of aripiprazole after intramuscular (IM) administration. The present phase one study evaluated the pharmacokinetics (PK), safety and tolerability of a new dose of AL (1064mg) that was recently approved by the FDA for use as a two-month dose-interval option.

**Methods:** This was a phase one, 44-week, open-label study of AL (Clinicaltrials.gov: NCT02320032) evaluating PK and safety in patients with schizophrenia or schizoaffective disorder. Patients (n equals 139) were randomized to one of three groups: AL 441mg every four weeks (q4wk), AL 882mg every six weeks (q6wk), or AL 1064mg q8wk, with a total of seven, five, or four IM injections administered, respectively. No oral aripiprazole lead-in supplementation was administered and patients continued on maintenance oral antipsychotics. PK and safety assessments occurred during the 24-week study period and 20-week follow-up period. Plasma concentrations obtained from the phase 1 study were analyzed using non-compartmental methods. Additionally, the PK data were combined with data collected from four prior studies (n equals 561 patients) to develop the two-month population PK (2MPopPK) model.

**Results:** Administration of AL 1064mg q8wk provided continuous exposure to aripiprazole and yielded aripiprazole concentrations that were within the range associated with clinically effective and well-tolerated doses of currently approved AL. The mean half-life of aripiprazole following last dose of AL was independent of dose and ranged from 54 to 57 days. The overall safety profile of AL 1064mg q8wk was comparable with the 882mg q6wk and 441mg q4wk
groups. The most common adverse event (AE) for all groups was injection-site pain. Other AEs that occurred in greater than or equal to 5 percent of patients included dyskinesia, back pain, neck pain, hypertension, and nasopharyngitis. Akathisia was seen in 2.9 percent, 8.8 percent and 8.6 percent of patients in the 1064mg q8wk, 882mg q6wk, and 441mg q4wk groups, respectively. Psychotic disorder (described as increased psychosis or exacerbation/worsening of schizophrenia) was reported as a serious AE in 2.9 percent of patients in the 1064mg q8wk and 882mg q6wk groups and in 5.7 percent of patients in the 441mg q4wk group. The model showed that median steady-state concentrations of aripiprazole for the 1064mg q8wk regimen were comparable with the 882mg q6wk and 662mg q4wk regimens.

**Conclusion:** The PK results from this study show that a dosing interval of q8wk for the 1064mg dose resulted in aripiprazole concentrations within the established therapeutic concentrations of approved doses of AL. The safety profile of AL 1064mg q8wk was consistent with currently approved doses/dose intervals. All patients continued their primary antipsychotics without any apparent tolerability issue arising from the addition of the AL injections. The results of this study support AL 1064mg using a two-month dose interval.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Psychiatry / Neurology

Session-Board Number: 7-145

Poster Title: Psychiatric patients with antipsychotic drug-induced hyperprolactinemia and menstruation disorders

Primary Author: Kenshi Takechi, Tokushima University Hospital; Email: dph20010@s.okadai.jp

Additional Author (s):
Yoshito Zamami
Masaki Imanishi
Keisuke Ishizawa
Hiroaki Yanagawa

Purpose: Treatment with antipsychotic drugs has been associated with hyperprolactinemia. The same antipsychotic drugs have also been associated with side effects such as menstruation disorders. The aim of this study was to evaluate the prevalence of hyperprolactinemia and menstruation disorders in women undergoing antipsychotic treatment. We performed a retrospective chart review study of psychiatric patients who underwent laboratory testing for serum prolactin (PRL) level in the hospital. Patients presenting with and without menstruation disorders were evaluated to determine if they presented concomitant hyperprolactinemia.

Methods: This retrospective study was carried out at the university hospital using data from electronic medical records dated between March 2011 and March 2015. We excluded the medical records of pregnant women, nursing women, as well as women with hypothyroidism or hypophyseal adenoma. Patients who underwent serum PRL monitoring after administration of psychiatric drugs were enrolled in this study. Patient characteristics (age [under 55 years], sex [only women]) and necessary research data (serum PRL and prescription history) were collected from the medical records of 83 patients with psychiatric disorders. The antipsychotic drugs prescribed in this study were chlorpromazine, haloperidol, levomepromazine, risperidone, paliperidone, quetiapine, olanzapine, blonanserin, aripiprazole and clozapine. We used the equation described by Woods to calculate the equivalent dose of chlorpromazine for the dose of the other psychiatric drugs. The antipsychotic drug dosages used were then compared by chlorpromazine equivalent dosages. This study was conducted in accordance with the guidelines for the care of human study participants adopted by the Ethics Committee of Ehime University Hospital (approval number: 1602009), the Ethical Guidelines for Medical and Health Research Involving Human Subjects, and the principles of the Helsinki Declaration.
Results: Patients with menstrual disorders had a significant increase in serum PRL level with a mean of approximately 90 ng/mL. Those with menstrual disorders presented increased PRL levels by 2-fold that of patients without menstrual disorder. However, there was no significant difference in the equivalent dose of chlorpromazine between these two groups. Additionally, about 70% of patients with menstrual disorders received risperidone treatment. The receiver operating characteristic curve showed that the optimal cutoff point of serum PRL level associated with the development of menstrual disorders was 60 ng/mL.

Conclusion: Although further studies are required to clarify the involvement of hyperprolactinemia in the adverse effects induced by psychiatric treatment, our findings indicate that clinicians should monitor PRL in these patients based on the cutoff value of 60 ng/mL to improve early detection of adverse effects such as menstrual disorders.
Submission Category: Small / Rural

Session-Board Number: 7-146

Poster Title: Establishing a pharmacy-driven antimicrobial stewardship program in a small community hospital

Primary Author: Stacy Bratton, University Hospitals Portage Medical Center; Email: stacy.bratton@uhhospitals.org

Additional Author(s):
Stacey Preston

Purpose: As recommended by the Infectious Disease Society of America (2007), the Center for Disease Control and Prevention (CDC, 2014), and the White House National Action Plan for Combating Antibiotic-resistant Bacteria (2015), we formed an antimicrobial stewardship program (ASP) in 2014. Establishing an effective program at our community hospital was challenging given we were undergoing ownership changes and have limited resources as a 117 bed hospital. We did not have dedicated resources for an infectious disease physician and infectious disease-trained pharmacist to lead the initiative. Our challenge was to implement this program with our current pharmacist staff.

Methods: In the fall of 2014, we invited key staff to the first meeting of establishing ASP; these members included: infectious disease physician (co-leader), clinical pharmacist (co-leader), medical staff administrator, pathologist, emergency physician, pharmacy manager, clinical pharmacist, infection preventionist nurse, quality improvement, microbiologist, and nursing administrator. Our initial meetings involved finalizing the committee structure, completing the CDC Checklist for Core Elements of Hospital Antibiotic Stewardship Programs, reviewing other key antimicrobial stewardship references, and benchmarks from an ASP annual report from a previously affiliated hospital. The ASP committee took on the tasks of reviewing the hospital antibiogram annually for changes in local susceptibility patterns, the antimicrobial-related Pharmacy & Therapeutics (P&T) policies (e.g. IV to oral, renal dosage adjustment, restricted antimicrobials), and annual antimicrobial cost data. Other activities included educational memos to the prescribers about avoidance of double anaerobic coverage and ertapenem alternatives guideline, nursing education ASP poster, and patient education handouts (Get Smart about Antibiotics, CDC). At our quarterly meetings, we have been tracking ASP-related pharmacist interventions. These interventions were subcategorized as automatic (pharmacy-driven per P&T policy) and recommendations (requiring discussion with the prescriber). We
also tracked the rate of acceptance of our recommendations. The ASP-related interventions for 2015 and 2016 were shared with the Medical Executive Committee at our first annual report.

**Results:** Prior to establishing the program, we were performing pharmacist-driven antimicrobial stewardship activities (e.g. renal dosage adjustment, IV to oral conversion, vancomycin dosing), along with making recommendations to de-escalate and discontinue antimicrobials. Pharmacists were documenting pharmacy interventions in the electronic medical record, but we did not have a report to capture the data or a way to tease out ones that were specifically related to antimicrobial stewardship. When we started the program, we asked all pharmacists to “double-document” on a spreadsheet any interventions that were related to antimicrobial stewardship, including whether the intervention was automatic (per P&T policy) or if the pharmacist contacted the prescriber, and whether the recommendation was accepted. The numbers of ASP-related interventions documented were 1116 (2015) and 1270 (2016). And while the pharmacy-driven interventions increased, the number of recommendations decreased 62% from 420 (2015) to 158 (2016). While some might surmise the decrease in recommendations is positive because of education, feedback, and improvements in antimicrobial prescribing, we also know that competing demands for new pharmacist services in 2016 with the same pharmacist staff could also explain the decline. Encouragingly, the rate of acceptance of recommendations improved from 92% (2015) to 96% (2016).

**Conclusion:** Establishing an effective antimicrobial stewardship program involved a multi-faceted approach that resulted in visible changes in antimicrobial stewardship without hiring new staff. When presented with the results of our work, the Medical Executive Committee asked for a proposal to expand antimicrobial stewardship services, indicating strong leadership commitment and approval. While limited resources may prohibit creation of pharmacist positions, our next step is pharmacist rounding with infectious disease staff to increase our focus on targeted antimicrobial interventions that are widely believed to have more impact, like antimicrobial de-escalation, discontinuation, and/or changing to alternate antimicrobials.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Small / Rural

Session-Board Number: 7-147

Poster Title: No man is an island: collaborative antibiotic stewardship at a critical access hospital

Primary Author: David Caron, Martha's Vineyard Hospital; Email: dcaron2@partners.org

Purpose: Rural hospital pharmacies resource challenged. It is critical that the pharmacy collaborates with other practitioners to ensure the vitality of important programs. Our intent is to make Antibiotic Stewardship a “household name” at Martha’s Vineyard Hospital. The goal is to promote the Stewardship plan endorsed by the Pharmacy and Therapeutics Committee so that front line personnel can apply all initiatives into clinical practice. To emphasize to the importance of such a policy, the hospital also engage other state wide resources to validate our ongoing promotion of Stewardship.

Methods: In April 2017, the Martha’s Vineyard Hospital Pharmacy entered into a collaborative agreement with Health Centric Advisors (HCA). HCA is the contracted administrator of the New England Quality Innovative Network, the Medicare quality improvement organization for New England. Though Martha’s Vineyard Hospital (MVH) Pharmacy and Therapeutics Committee (P&T) had formalized an Antibiotic Stewardship policy in August of 2014, the contract kicked our efforts into high gear. Through HCA conference calls, our core hospital team (ER Director, Quality Manager, Staff Pharmacists, Outpatient Infusion manager, and Nurse Educator) were able to set the tone of how to promote Stewardship at MVH. In addition, we were able to add some robust initiatives such as an Education Plan and antibiotic restrictions. Though our past efforts were enforceable, the revitalization allowed our hospital to promote better awareness and guiding principles.

Results: In April 2017, the MVH P&T committee reworked our existing Stewardship policy to match the Core Elements as defined in the HCA collaboration agreement. We defined our Stewardship efforts into five categories; Leadership, Drug Expertise, Action, Tracking, and Education. Some of the initiatives that were added after the collaboration include a proposed automatic antibiotic IV to PO program, a community awareness campaign, restrictions on daptomycin and ertapenem, and an indication-driven antibiotic order-entry system. In addition, the P&T Committee took a more aggressive leadership role with Stewardship, and self-promoted each of the core elements as it related to individual departments and areas of expertise. The Emergency Medical Chief became a champion of Stewardship throughout the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
institution, and endorsed our efforts within the Medical Staff. Through this confirmation, we were able to develop antibiotic dosing regimens, protocols and guidelines for hospital-wide use.

**Conclusion:** Rural hospital pharmacists often face staffing challenges unlike our larger facility counterparts. Our goal was to collaborate with other practitioners to ensure the vitality of important initiatives like Antibiotic Stewardship. By working with other leaders, we were able to promoting alternative policy, procedure, and philosophy to allow for more cost-effective and clinically sound antibiotic prescribing. In addition, these strategies promoted the role of Antibiotic Stewardship in a way that was achievable throughout the continuum of care.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Small / Rural

Session-Board Number: 7-148

Poster Title: Impact of pharmacist decentralization in a rural hospital

Primary Author: Ashley Halloran, CompleteRx; Email: ahalloran@completerx.com

Additional Author(s):
Paul Green

Purpose: Traditionally, in small, rural, community hospitals, the work of the pharmacy staff has been limited to a centralized pharmacy and a primarily order entry role. Over time, the pharmacist’s role has expanded to include clinical tasks and patient education, yet much of the work has remained in the central pharmacy for a variety of reasons including staffing, equipment availability, and clinical knowledgebase. Pharmacy staff presence on the floor consisted primarily of technicians delivering medications or refilling automated dispensing cabinets. To address this and increase pharmacist engagement with the healthcare team and patients, we developed a workflow to decentralization our pharmacists.

Methods: For approximately seven months, a bi-weekly meeting of various pharmacy staff members was facilitated by the pharmacy management team to develop a decentralized pharmacist program. Five key errors for improvement were identified: pharmacy technician workflow, pharmacist workflow, pharmacist shifts/schedules, identification of units to staff, and pharmacist education. Redesign of workflow and staffing models was conducted early on and took approximately two months to complete. Pharmacist education was held in small group sessions to encourage open communication and help bridge the knowledge and experience gap of the pharmacists. Along with pharmacy-specific concerns, the pharmacy management team and several key pharmacists began meeting with a variety of nursing staff members whose input was requested in order to determine what unmet needs of that departments existed. The nursing staff was also educated on where to locate the decentralized pharmacists, how to contact them, and when to utilize them as their source of information and communication to the pharmacy department. Following the identification of specific of needs, the information technology department was leveraged to help streamline reporting and remove as much unnecessary manual manipulation of the electronic medical record as possible. After six months of intensive planning and training including a three-month pilot program, the department officially decentralized its pharmacists in early 2016.
Results: The decentralization of the pharmacists was a department-wide initiative, and the success of the project was ultimately due to a high level of staff engagement. Overall Nursing Pharmacy Satisfaction Survey scores improved 18 percent from 2014 to 2016. Medication turnaround time improved 33 percent from 40 minutes in 2014 to 26.8 minutes after the program’s implementation was complete. Pharmacist-led interventions increased 139 percent during the same time period.
Significant workflow changes and employee professional growth made this decentralized, unit-based staffing model possible. The department has seen improved patient care by facilitating a multidisciplinary approach to patient care by allowing the pharmacists to be utilized to their greatest potential. The program even spurred the restructuring of the hospital’s multidisciplinary rounds held on each of the inpatient units to better coordinate the knowledge of the entire healthcare team, including the pharmacist. By leveraging the facility’s electronic medical record, the transition of the pharmacy department from a centralized to a decentralized, unit-based model was implemented successfully and without the need for any increase in staffing.

Conclusion: Overall, the decentralization of our pharmacists has greatly improved the pharmacy department’s relationship with nursing staff and providers and has enabled us to better serve our patients. The delivery of our services has increased in both quality and as assessed by the Nursing Pharmacy Satisfaction Survey, documentation of pharmacist-led interventions, and monitoring of medication turnaround time studies.
Submission Category: Small / Rural

Session-Board Number: 7-149

Poster Title: Pharmacoeconomic impact of outpatient parenteral antibiotic therapy with dalbavancin for the treatment of acute bacterial skin and skin structure infections at a rural, community hospital

Primary Author: Anastasia Jenkins, University of Mississippi School of Pharmacy; Email: anastasiaballas@gmail.com

Additional Author(s):
Trey Crumby

Purpose: Acute bacterial skin and skin structure infections (ABSSSIs) are increasing in prevalence and resulting in more hospital visits each year. Patients admitted for treatment of ABSSSI typically incur costs that exceed reimbursement, with only about 60 percent of costs recovered. Dalbavancin, a lipoglycopeptide antibiotic, was introduced in 2014 for gram-positive ABSSSIs. Dalbavancin’s half-life allows for a single 30-minute infusion, providing an opportunity to forgo inpatient admission. The purpose of this project was to implement outpatient parenteral antimicrobial therapy (OPAT) using dalbavancin in a 217-bed hospital and determine the pharmacoeconomic impact as well as the appropriateness of dalbavancin prescribing.

Methods: The institutional review board reviewed this retrospective study that compared protocol patients to historical controls. The dalbavancin project was implemented in March 2016, and included education of emergency department (ED) physicians and case managers. Physicians were provided with a usage recommendation flowsheet to guide their prescribing of dalbavancin. Dalbavancin was deemed inappropriate for patients with: infections associated with a prosthetic device; severe sepsis/septic shock; bacteremia, infected burns, necrotizing process, gangrene, or diabetic foot infection; chronic ulcer/wound treated with broad spectrum antibiotics in the previous 90 days; human or animal bite; gram negative or polymicrobial infections; concomitant infection; previous failure of vancomycin for ABSSSI; immunosuppression or neutropenia; or hypersensitivity to glycopeptides. Patients were included in the project if they were ages 18 and above, diagnosed with ABSSSI, not pregnant, and received dalbavancin in the ED between 3/1/16 and 6/15/17. Data collection included demographic data, diagnosis, comorbidities, insurance coverage, vital signs and lab values upon admission, culture results, and antibiotic therapy administered during admission and at discharge. Cost and reimbursement data was also collected. Data collection for historical

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
controls included the same information, and was taken from patients meeting the same criteria but admitted for inpatient treatment prior to the implementation of the project (10/1/13 to 2/1/16). Patients were excluded from the pharmacoconomic evaluation if they were self-pay, or no reimbursement information was available.

**Results:** 90 patients were diagnosed and admitted with ABSSSI between 10/1/13 and 2/1/16, and average length of stay was 4.6 days, hospital charge was $21,992.77 and reimbursement was $7,505.28; representing a loss of $14,487.49 per patient. 2/90 patients were readmitted within 30 days (2.2%). 62/90 patients had abscess cultures collected, and 69% of their cultures were either Staphylococcus or Streptococcus species. Following implementation of the project, 30 patients were treated with outpatient dalbavancin between 3/1/16 and 6/15/17. 1/30 patients was readmitted within 30 days of the ED visit (3.3%). Insurance providers were 57% public, 29% private, and 14% self-pay. The average duration of symptoms was 5.4 days. 8% of patients had a previous admission and 50% had been previously prescribed antibiotics for the same condition. 11% were given concomitant antibiotics, and 29% were given antibiotics when discharged from the ED. 23/30 patients were included in the pharmacoeconomic evaluation. Average hospital charge was $16,744.74 and reimbursement was $4,434.87; with an average percentage reimbursement of 26.5%. Due to 340B pricing, reimbursement covered 100% of dalbavancin cost. Dalbavancin was used appropriately according to the usage flowsheet in 68% of patients; however, 4/9 cases of inappropriate use.

**Conclusion:** Use of dalbavancin in the ED was a economically viable compared to traditional inpatient ABSSSI treatment at this rural, community hospital with 340B pricing. Prescribers followed usage recommendations in most patients receiving dalbavancin. Patients representing inappropriate use were refusing admission, and physicians felt that dalbavancin administration represented best care for those patients. Education regarding concomitant antibiotics during and after dalbavancin use is essential to ensure that patients do not receive inappropriate antibiotics for ABSSSI. Continual monitoring of the use of the product and its reimbursement are essential to ensure that the medication is being used appropriately and is financially feasible.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Small / Rural

Session-Board Number: 7-150

Poster Title: Quality improvement and assessment for a hypoglycemia episode reduction program in patients receiving insulin glargine in a rural community hospital

Primary Author: Deirdre Pierce, St. John Fisher College Wegmans School of Pharmacy; Email: dpierce@sjfc.edu

Additional Author (s):
Ryan Van Horn

Purpose: Best practice for managing diabetic patients upon admission suggests the continuation of the home basal insulin dose. As a result of an ongoing hypoglycemia quality assessment, it was determined that some patients, when placed on their home basal insulin regimens, consequently experienced lower fasting blood glucose levels each day until a hypoglycemic episode occurred. A need was identified to pre-emptively recognize patients with decreasing fasting blood glucose values before hypoglycemia occurred, and to determine the utility of pharmacist intervention to prevent this negative outcome. Hypoglycemia episodes have been associated with increased patient morbidity, mortality, and increased length of hospital stay.

Methods: The inclusion criteria utilized for the quality assessment included fasting blood glucose values for medical and surgical floor patients, age 18 years or older, who received basal insulin. The values were screened between November 24, 2016 through February 24, 2017 for the pre-intervention group and from March 1, 2017 through May 31, 2017 for the post intervention group. Emergency department and critical care patients were excluded. Hypoglycemia was defined as fasting blood glucose less than or equal to 70 mg/dl, as per hospital protocol, treatment must be administered at or below this level. Educational interventions with prescribers were aimed at increasing awareness of hypoglycemia occurrences with home insulin glargine regimens and included data and graphs illustrating those patients with hypoglycemic events. Subsequent drops in fasting blood glucose values were described for each day the home dose of basal insulin was continued without intervention for dose reduction. Using a newly implemented surveillance tool, a hypoglycemia screening notification alert was developed. When a patient’s morning fasting blood glucose level dropped below 100 mg/dl, an alert was emailed to the pharmacist for review. In those patients identified to be at risk for developing hypoglycemia, the prescriber was notified to ask for

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
insulin glargine dose reduction, generally when the fasting blood glucose trended below 90 mg/dl.

**Results:** For the pre-intervention group, 146 fasting blood glucose values less than 100 mg/dl were screened, with 16 hypoglycemia events that occurred. Results in the post intervention group revealed 121 fasting blood glucose values that were screened, with only one occurrence of hypoglycemia that was identified.

**Conclusion:** As a result of these hypoglycemia event reduction interventions, it was determined that for every 10 cases screened, one case of hypoglycemia was prevented. While preliminary, these results do indicate a benefit of prescriber education and a pharmacy-based intervention program.
Submission Category: Small / Rural

Session-Board Number: 7-151

Poster Title: Evaluation of a pharmacist driven vancomycin dosing protocol in a community hospital

Primary Author: Stacey Preston, University Hospitals Portage Medical Center; Email: stacey.preston@uhhospitals.org

Purpose: In 2009 vancomycin consensus guidelines were published which emphasized the use of weight-based dosing and rapidly obtaining target trough concentrations for better outcomes in serious infections. Our pharmacy department developed a vancomycin dosing protocol based on the guidelines in 2012, but a literature search found a lack of data for guideline based dosing in small hospitals. This study compared the efficacy of the pharmacy vancomycin dosing protocol in achieving guideline recommended trough levels as compared to traditional physician dosing in a small community hospital. Rates of acute kidney injury between the groups was also compared.

Methods: This study was a quasi-experimental, retrospective chart analysis of adult patients at our institution. The study included patients who were prescribed intravenous vancomycin from March 2012 to June 2015. Patients who had pharmacy consults for dosing by the pharmacy vancomycin protocol were compared to patients dosed traditionally by the physicians. Patients were included if they received at least 3 doses of vancomycin and had a level obtained prior to a steady-state dose per the guidelines. Patients were excluded if they were pregnant, on dialysis, or switched dosing groups prior to an appropriately timed trough being drawn. All patients who received a dose of intravenous vancomycin and had more than one serum creatinine measurement were included in the comparison of acute kidney injury rates. Patients were considered to have experienced acute kidney injury if they had an increase of greater than 0.5 mg/dL (or a 50% or greater increase) in serum creatinine measurements from the baseline. The data analysis used descriptive statistics to compare the patient demographics. The primary objective, occurrence of patients achieving target trough measurements, and the secondary objective, incidence of nephrotoxicity, was evaluated using the Chi-square test.

Results: There were 180 patients that met the inclusion criteria. Of these, 32 (18%) were excluded because they did not have levels drawn at an appropriate time. Therefore, 148 patients were analyzed for the primary endpoint, with 57 patients in the pharmacist dosing group and 91 in the traditional dosing group. There was a statistically significant increase in the

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
proportion of patients who achieved the goal trough in the pharmacist dosing group compared to the traditional dosing group (23 [40%] vs 22 [24%]; P=0.037). The assessment of acute kidney injury analysis included all 180 patients who met the inclusion criteria. There was not a statistically significant difference in the incidence of acute kidney injury between the pharmacist dosing group and the traditional physician dosing group (10 [14%] vs 19 [17%]; P=0.59).

**Conclusion:** The results of this study showed that the pharmacist dosing protocol developed at our hospital achieved a therapeutic trough almost twice as often as traditional physician dosing in our patient population. While the patients in the pharmacy dosing group received higher doses of vancomycin than the patients in the traditional dosing group, the increased doses did not lead to an increase in acute kidney injury. In conclusion, the utilization of an evidenced-based pharmacy dosing protocol improved achievement of goal vancomycin troughs in our community hospital.
Submission Category: Toxicology

Session-Board Number: 7-152

Poster Title: Cyanide toxicity secondary to ingestion of apricot seeds: a case report

Primary Author: Lama Kanawati, MedStar Washington Hospital Center; Email: lama.kanawati@medstar.net

Purpose: This case describes cyanide toxicity secondary to ingestion of apricot seeds. Institutional review board determined that this case does not constitute clinical research. Therefore, institutional review board review and approval of this case report is not required. A ninety year old female presented to the hospital with nausea, vomiting, abdominal pain and tachycardia. Blood tests revealed severe lactic acidosis, lactate level greater than 15 mmol/L, and pH 7.26. Past medical history includes hypertension and iron deficiency anemia. Home medications are atenolol, hydrochlorothiazide, iron, and aspirin prophylaxis. Patient had been eating about 5 apricot seeds daily for the past year as a prevention measure for cancer development. Cyanide toxicity secondary to ingestion of apricot seeds was suspected since all other tests were negative. Patient was treated with one dose of hydroxycobalamine 5 g intravenously and recovered from the toxicity. Lactate level decreased to 5 mmol/L one hour post treatment, and was normal 14 hours post treatment. Pre-treatment cyanide level was 0.76 mg/L, in the lower end of the toxic range. Apricot seeds, as well as peach seeds and bitter almonds contain amygdalin, a compound that forms hydrogen cyanide. Cyanide inhibits aerobic metabolism that leads to lactic acidosis. Severe toxicity can lead to apnea, convulsions, cardiac arrest and death. Patients may be using home remedies for cancer prevention without realizing potential toxicity. This case illustrates the importance of recognition of home remedies for possible toxicity and patient education regarding home remedies.
Submission Category: Toxicology

Session-Board Number: 7-153

Poster Title: Occurrence and severity of skin injury caused by extravasation of cytotoxic and non-cytotoxic drugs

Primary Author: Yuuka Shibata, Hiroshima University Hospital; Email: utatti@nifty.com

Additional Author(s):
Ryo Itamura
Tomoharu Yokooji
Maiko Tanaka
Hiroaki Matsuo

Purpose: Inadvertent leakage of medication may cause severe necrosis of tissue. According to the extravasation management guideline, cytotoxic agents are classified into vesicant, irritant, non-vesicant by the severity of injury. The severity of tissue damage by cytotoxic medication depends on the toxic properties of drug itself. On the other hand, tissue damage by non-cytotoxic agents is affected by several drug-related conditions, including osmolarity, pH, and a mechanism of action. The aim of this study is to clarify the incidence rate and severity level induced by leakage of non-cytotoxic agents.

Methods: Forty-seven patients who were referred to Department of Dermatology, Hiroshima University Hospital, for treatment of extravasation between October 2013 and December 2015 were enrolled in this study. Patient background, leaked medicine, leakage site, local tissue findings, treatment, clinical course, compliance rate of hospital manuals for extravasation were retrospectively investigated. This study was approved by the Hiroshima University ethics committee (approval number: E-320).

Results: There were 47 cases of extravasation involving 26 agents (in order of frequency): carboplatin, radiographic contrast media, fluorouracil, oxaliplatin, vinorelbine, nafamostat, 50% glucose, parenteral nutrition, cisplatin, ifosfamide, paclitaxel, epirubicin, pirarubicin, amrubicin, thiamylal, tazobactam and piperacillin, noradrenaline, dobutamine, 10% sodium chloride, cefmetazole, cefazolin, and lipids. Of these, 26, 20 and 1 cases involved old patients (65-years-old and over), adults or adolescents, and a child, respectively. Twenty two cases of extravasation of cytotoxic agents did not show severe symptoms. Antidotes and supportive care agents such as systemic, subcutaneous, and intradermal administration of corticosteroids

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
were used in the management of these cases according to the hospital manual. However, 3 of 25 cases by extravasation of non-cytotoxic agents had serious symptoms, such as blisters or necrosis. Parenteral nutrition and noradrenaline were causative agents for the 3 serious cases. One patient required amputation of the affected limb and the others regressed within 7 days.

**Conclusion:** In this study we found that no severe cases who had extravasation of cytotoxic agents presumably due to proper treatments according to the hospital manual. In contrast, non-cytotoxic agents tend to induce severe symptoms because of insufficient risk recognition of those agents and/or large volume leakage. Understanding of the current situation is an essential step to prevent the deterioration of tissue damage by extravasation of non-cytotoxic agents. Medical staffs may also have underestimated the risk of non-cytotoxic agents. Thus, medical staffs should pay careful attention to extravasation of non-cytotoxic agents as well as those of cytotoxic agents.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Transplant / Immunology

Session-Board Number: 7-154

Poster Title: Assessment of a pharmacist led medication education and self-medication program in transplant recipients during their post-operative stay at a large transplant center

Primary Author: Ginny Tyler Meadows, UAB Hospital; Email: gmeadows@uabmc.edu

Additional Author(s):
Alexandra James
Juliana Kyle
Adam Dodson
Kris Gutierrez

Purpose: To help patients understand their medications and for adjustment post-transplant, we have implemented a self-administered medication program (SAMP) as a method of teaching patients their medications prior to hospital discharge. Patients are educated and taught to self-administer transplant medications under supervision of the healthcare team. This study's purpose is to evaluate the effectiveness of the pharmacist-led medication education and the self-meds program.

Methods: All solid organ transplant (SOT) recipients between September to November 2016 were screened for inclusion. Three questionnaires were administered to participants at three separate points in time during the SAMP process. Each questionnaire asked participants to rate their knowledge of transplant medications at that specific time as well as 10 knowledge-based questions that were covered during the pharmacist-led education. On questionnaire 2, the participants were also asked to disclose their satisfaction with the SAMP. Participants unable to complete the questionnaire, previous SOT recipients and participants on immunosuppression prior to transplant were excluded. All included participants completed three questionnaires.

Results: Eighty-two participants were evaluated for enrollment and forty-six were enrolled. Twenty-one participants completed all three surveys. Most participants were white males with 90% receiving an abdominal transplant. Patient’s self-knowledge significantly increased from baseline to surveys 2 and 3 compared to questionnaire 1. Likewise, participants answered more questions correctly on the last two questionnaires compared to questionnaire 1 (p < 0.001).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
**Conclusion:** The SAMP is an effective means of educating patients about medications post SOT. In our study, participants' knowledge significantly improved following medication education from baseline and participants scored significantly better on questionnaires 2 and 3 when compared to questionnaire 1. Furthermore, participants indicated that they are satisfied with the SAMP and felt overall confident upon discharge home.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Transplant / Immunology

Session-Board Number: 7-155

Poster Title: Defining the need for better tools and education on tacrolimus intrapatient variability to improve outcomes for transplant patients

Primary Author: Quentin O'Brien, Health and Wellness Partners; Email: qobrien@hwpnj.com

Additional Author(s):
Jacquelin Scully
Elizabeth Rappa
Purvi Smith
Jani Hegarty

Purpose: Consistent exposure to immunosuppressive drugs is critical to achieving success in long-term transplant patient outcomes. However, with immunosuppressive drugs like tacrolimus, intrapatient variability (IPV) can change exposure levels despite constant dosing, which may lead to poor health outcomes and graft failure. A survey of transplant health care providers was conducted to gain insight on unmet educational and resource needs related to the clinical implications of IPV.

Methods: An electronic survey was sent to a sample of solid organ transplant (SOT) health care providers, including pharmacists, physicians, and nurse practitioners. A total of 71 health care providers answered the electronic survey. Questions sought to characterize respondents’ familiarity with tacrolimus IPV, as well as their current IPV monitoring procedures. Respondents who currently monitor IPV were asked about their processes. Those who do not monitor IPV were asked to provide their reasons. Respondents’ perceptions of the importance of monitoring IPV were assessed, as well as their perceived ease of monitoring. Survey respondents were asked to characterize the broader transplant health care community’s understanding of the importance of monitoring IPV. Specific feedback was collected on the educational topics and formats that would be beneficial to transplant health care providers. The number of respondents varied per question; aggregated survey responses are summarized using descriptive statistics.

Results: Of the 71 respondents, the largest specialty group was nephrology (38%), followed by transplant medicine (20%) and SOT surgery (18%). Among respondents, 92% (65/71) manage immunosuppressive medications for posttransplant patients; on average, 88.8% of

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
respondents’ patients receive tacrolimus as a component of immunosuppressive therapy. Of those who manage immunosuppressive medications, 92% (60/65) are familiar with tacrolimus IPV; 63% (38/60) actively monitor IPV. The most common reason for not monitoring IPV was a lack of tools or protocol (64%, 14/22). Of those who monitor IPV, few indicated that they use formal monitoring tools such as spreadsheets or calculators, but 67% (35/52) would be highly likely to increase tacrolimus IPV monitoring if they had access to an appropriate tool. Of those who monitor IPV, 71% (22/31) of respondents agreed that it is highly important to monitor IPV when considering long-term patient outcomes, but only 29% (9/31) find it easy to monitor. Only 13% (7/52) of respondents believe that the transplant health care community has a good understanding of the importance of monitoring tacrolimus IPV. Respondents agreed that education on tacrolimus IPV would be beneficial and indicated that a variety of educational topics and formats would be valuable to transplant health care providers.

**Conclusion:** This survey demonstrates the current challenges associated with understanding and monitoring tacrolimus IPV among the transplant health care community. Nearly all survey respondents who manage posttransplant immunosuppressive medications indicated that they are familiar with the concept of tacrolimus IPV and believe it is important, but less than two-thirds actively monitor it. Furthermore, those who do not monitor IPV would be more likely to do so if they had access to an appropriate tool. These survey findings highlight the need for education and resources geared toward helping transplant health care providers monitor IPV to improve long-term health outcomes.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Transplant / Immunology

Session-Board Number: 7-156

Poster Title: Variable factors influencing the area under the concentration-time curve after administration busulfan in pediatric patients receiving a hematopoietic stem cell transplant conditioning regimen

Primary Author: Takanori Taogoshi, Hiroshima University Hospital; Email: taogo@hiroshima-u.ac.jp

Additional Author(s):
Aoi Nakano
Hiromi Kawaguchi
Masao Kobayashi
Hiroaki Matsuo

Purpose: Busulfan is an alkylating agent that plays an important role in conditioning regimen for hematopoietic stem cell transplantation. Area under the concentration-time curve (AUC) is calculated to evaluate and optimize the exposure levels of busulfan. The target AUC of busulfan is 900 to 1500 µM*min to avoid graft failure and side effects. There are many reports about intra- and inter-individual variability in pediatric patients. Therefore, it has been considered a necessity to do therapeutic drug monitoring (TDM) to optimize AUC of busulfan. The purpose of this study is to clarify the variation factor of AUC of busulfan in pediatric patients.

Methods: This study was intended for pediatric patients administered busulfan before hematopoietic stem cell transplantation. Blood samples were obtained from 9 pediatric patients prior to administration, 2, 3, 4 and 6 h after the start of busulfan administration on test dose and 1st dose of conditioning regimen. Serum busulfan concentrations were determined by high performance liquid chromatography. We calculated variation of AUC, infusion rate and clearance of busulfan (CL) and evaluate the relationship among these variation, age and body weight. Since busulfan is metabolized by glutathione S-transferase in the liver and excreted in urine, we also evaluated the relationship between AUC, alanine aminotransferase (ALT), aspartate aminotransferase (AST), total bilirubin (T-Bil), blood urea nitrogen (BUN) and serum creatinine (Scr).
Results: Two out of 9 pediatric patients, AUC of busulfan calculated from patient serum concentrations were 20% higher than target AUC in 1st dose of conditioning regimen. One patient had an AUC more than 1500 μM*min in test dose. There are no significant relationships between AUC variation, age and body weight (AUC variation vs age; p=0.493, AUC variation vs body weight; p=0.336). A significant correlation between AUC variation and infusion rate (p=0.017) was observed. On the other hand, there are no significant relationships between CL, age, body weight and infusion rate (CL vs age; p=0.133, CL vs body weight; P=0.437, CL vs infusion rate; p=0.213). The patients whose ALT more than 30 IU/L, there was a strong positive correlation between AUC and ALT (p=0.0167). The AUC of busulfan test dose was defined as an objective variable and body weight, ALT, AST, T-Bil, BUN and Scr were defined as explanation variables to conduct multivariate analysis and model selection. As a result, body weight (p=0.0701), ALT (p=0.0102), AST (p=0.0683) and Scr (p=0.109) were selected, especially ALT showed the highest contribution.

Conclusion: This study showed that AUC is influenced by infusion rate so we can be potentially improving prediction accuracy by adjust the infusion rate. In addition, if we refer to some lab data (ALT, AST and Scr) before busulfan administration, patients may avoid from dissociation between actual and target AUC. Further data are needed to clarify the factors that influence AUC of busulfan and confirm prediction approach.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
Submission Category: Transplant / Immunology

Session-Board Number: 7-157

Poster Title: Inpatient resource utilization and mortality in adult patients with acute graft-vs-host disease following allogeneic hematopoietic stem cell transplantation

Primary Author: Jingbo Yu, Incyte Corporation; Email: jyu@incyte.com

Additional Author(s):
Glenn Magee
Shreekant Parasuraman

Purpose: Approximately half of patients undergoing allogeneic hematopoietic stem cell transplantation (HSCT) may develop acute graft-vs-host disease (aGVHD), a complication that could be life threatening. There is limited evidence on the economic and clinical burden of aGVHD post-HSCT. This study compared inpatient resource utilization, costs, and mortality among adult patients undergoing allogeneic HSCT with and without aGVHD.

Methods: The Premier Healthcare Database, a large US hospital data source covering 6 million hospital discharges annually, was used for the study. The database included all services provided in hospitals except physician service. Adults discharged for first allogeneic HSCT between 1/1/2011 and 12/31/2015 were identified using International Classification of Diseases (ICD) codes for HSCT (ICD-9 41.02, 41.03, 41.05, 41.06, 41.08; ICD-10 30233G1, 30233Y1, 30240Y1, 30243G1, 30243Y1, 30253X1) and inpatient aGVHD (ICD-9 279.50, 279.51; ICD-10 D89.810, D89.813). Hospital length of stay (LOS), intensive care unit (ICU) admission rate, mortality status at discharge, and total hospital costs were compared among patients with and without aGVHD during the initial HSCT hospitalization. All-cause, 100-day hospital readmission rate, and associated LOS and hospital costs were compared between patients with and without aGVHD within the first 100 days. Hospital costs were defined as costs of facilities, treatment, and all other inpatient service (eg, labs, procedures) reported by the hospital. Costs for physician services were not reported. Categorical variables were compared using chi-square test, and continuous variables were compared using the Student t test or Kruskal-Wallis test. Unadjusted odds ratio (OR) and 95% confidence interval (CI) for categorical outcome variables were reported as well.

Results: 2431 patients undergoing initial HSCT were identified from 76 US hospitals. Of these, 921 (38%) had aGVHD post-HSCT: 454 (49%) during initial HSCT admission, 625 (68%)
readmitted within 100 days of HSCT. Demographic characteristics were similar between patients with vs without aGVHD: mean age, 51 years; men, 58%; commercial insurance, 64%. During initial HSCT hospitalization, patients with aGVHD had higher mean LOS (39 vs 27 days), ICU admission rate (36% vs 22%), mean hospital cost ($207,767 vs $133,759), and mortality rate (12% vs 7%) than patients without aGVHD (all P < 0.001). All-cause hospital readmission rate within 100 days post-HSCT was higher among patients with aGVHD (79% vs 30%, P < 0.001; OR, 7.9; 95% CI, 6.5-9.5), with 37% and 6% having ≥ 2 readmissions, respectively. Mean LOS of readmission was longer (23 vs 13 days; P < 0.001) and mean hospital costs were higher ($87,822 vs $40,659; P < 0.001) among patients with aGVHD. Among patients who had aGVHD during initial HSCT hospitalization, 35% were readmitted with aGVHD, and 46% had ≥ 2 readmissions for aGVHD within 100 days of HSCT. Inpatient mortality rate during the first 100 days post-HSCT was 22% vs 10% for patients with vs without aGVHD (P < 0.001; OR, 2.5; 95% CI, 2.0-3.1).

**Conclusion:** Acute GVHD significantly increased inpatient resource utilization (ie, LOS and ICU admission) and costs of initial HSCT hospitalization. Occurrence of aGVHD more than doubled the 100-day readmission rate. One third of patients with aGVHD during HSCT hospitalization had one or more readmission for aGVHD within 100 days of HSCT. Mortality rate during HSCT hospitalization and readmissions post-HSCT doubled among patients with aGVHD.
Submission Category: Women's Health

Session-Board Number: 7-158

Poster Title: Exploring pharmacological management and determining the effectiveness and safety of ondansetron for hyperemesis gravidarum in Women’s Hospital-Qatar

Primary Author: Pallivalappila Abdurouf, Hamad medical corporation; Email: pabdurouf@hamad.qa

Additional Author (s):
Moza Sulaiman Al-Hail
Asma Tarannum
Binny Thomas
Wessam Mohammed El Kassem

Purpose: Nausea and vomiting occurs in 35 to 91% of all normal pregnancies. Hyperemesis Gravidarum (HG) in contrast, is a rarely occurring severe form of nausea and vomiting that affects nearly 0.3 to 3% of all pregnancies and associated with both perinatal and maternal morbidity, Although subjective nature of HG makes it difficult to manage, still early diagnosis and immediate treatment based on current evidence would avoid maternal and fetal complications associated with HG. The purpose of this study is to explore prescribing pattern of antiemetics for HG and to determine the effectiveness and safety of Ondansetron for HG.

Methods: It’s a retrospective study of medical files review. This study included all pregnant women diagnosed of hyperemesis gravidarum from 1st Jan 2009-to 1st June 2011, and excluded those HG cases which are not pregnancy related (UTI, Thyroid disease ..etc.). Randomization was used to form the study cohort which is further divided into two groups included women who were exposed to ondansetron and women exposed to other anti-emetics. Ethical approval was obtained from HMC medical research center. Main outcome measures: prescribing patterns of antiemetics, pregnancy outcomes (rates of live births, mode of delivery, stillbirths, therapeutic abortions, preterm delivery & miscarriage), neonatal outcomes (APGAR score, gestational age at birth & mean birth weight), and effectiveness (number of readmissions & length of stay).

Results: Initially, 154 files representing HG cases were reviewed based on inclusion criteria, of which 43 cases (18 cases with Ondansetron, 25 cases without Ondansetron) were included in the study. There are no significant differences in population characteristics (age, gravity..etc).

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.
67% of the study population was aged between 21 yrs - 30 yrs, and 65% percent were multigravida. Overall, wide variation was observed in pharmacological management of HG among doctors. Between 37% - 60% of patients received Metoclopramide, followed by Ondansetron (19% - 29%), pyridoxine plus metoclopramide (18% - 28%) and pyridoxine alone (11% - 14%) in all the three admissions. No consistency was found while choosing different drugs as first line or second line. Almost 10% of patients did not receive any medication on discharge. 30% of the Patients with HG were managed differently on each admission. No significant difference in LOS between the two groups (2.13 days vs 2 days p > 0.05). Although, Ondansetron reduced the average number of readmissions (by 28% p < 0.015), it is not superior to other conventional medications in treating HG except for refractory cases. Our study did not find any significant difference in pregnancy and neonatal outcomes between the two groups.

Conclusion: Current study suggests there is inconsistency in pharmacological treatments of HG in our hospital. This calls for immediate development of clinical protocol or guidelines, making care more consistent and efficient and for closing the gap between clinical decision and evidence support. Although our study demonstrates Ondansetron being equally safe compare to other conventional antiemetics, and also effective in terms of readmission rates, these results need to be further evaluated utilizing well-studied randomized control trails.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Women's Health

Session-Board Number: 7-159

Poster Title: Impact of a dinoprostone to misoprostol interchange for cervical ripening in a community hospital

Primary Author: Makini Alleyne-Paramo, Cardinal Health; Email: makini.alleyneparamo@cardinalhealth.com

Additional Author(s):
Katherine Shea
Betty Hart

Purpose: Cervical ripening is an integral part of pre-operative care in pregnancy to reduce complications in labor. The process of cervical ripening is complex and results in the physical softening of the cervix causing cervical effacement and dilatation thus improving the likelihood of vaginal delivery. Literature suggests that misoprostol and dinoprostone are effective for cervical ripening. Dinoprostone has been approved by the FDA for cervical ripening but misoprostol is used off-label for this indication. Misoprostol and dinoprostone are both used for cervical ripening and labor induction; however, misoprostol use results in roughly 5% the acquisition cost of dinoprostone. Investigators sought to assess the impact of a dinoprostone restriction program on consumption, acquisition cost, and cesarean section rates.

Methods: This was a single center, retrospective study comparing consumption before (October 2014-September 2015) and after (October 2015-September 2016) implementation of a dinoprostone restriction program. Misoprostol was considered the preferred agent for cervical ripening and dinoprostone was restricted to patients that failed misoprostol or met one of the following criteria: intrauterine growth restriction, oligohydramnios, or the presence of fetal anomalies. The interchange was approved by the Pharmacy and Therapeutics Committee in September of 2015. Consumption was assessed by cost per acute patient day (cost/APD). Additionally, acquisition cost and cesarean section rates were assessed pre and post-implementation. A Student’s t-test was used to compare consumption and acquisition cost. The Chi square test was used to assess cesarean section rates between the pre-and post-intervention groups.

Results: The hospital experienced a significant reduction in mean (+ SD) dinoprostone cost/APD post implementation [(2.34 + 0.93) vs. (0.97 + 0.71); p=0.004]. A corresponding increase in

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
misoprostol [(0.0 + 0.01) vs. (0.01 + 0.01); p=0.017] was demonstrated. Total acquisition cost for dinoprostone significantly decreased ($24,417.12 vs. $9,838.80; p=0.004); however, only slightly increased for misoprostol ($49.44 vs. $229.96; p=0.093). No difference was identified in the number of total cesarean sections or in the number of patients requiring a primary C-section (p=NS).

**Conclusion:** Implementation of restriction criteria for dinoprostone was an effective strategy for reducing consumption and acquisition cost while maintaining similar cesarean section rates.

*Special symbols that were not spelled-out per the guidelines were translated into unknown characters.*
Submission Category: Women's Health

Session-Board Number: 7-160

Poster Title: Prevalence and awareness of polycystic ovary syndrome among the Lebanese population

Primary Author: Fatima Baderddine, Pharmacist; Email: 30930484@students.liu.edu.lb

Additional Author(s):
Hiba Saadeddine
Diana Malaeb

Purpose: Polycystic ovary syndrome (PCOS) is the most common heterogeneous endocrine disorder in women of reproductive age. There were no epidemiological studies assessing the prevalence and the level of awareness of PCOS in the Lebanese population. Therefore this study was conducted to determine the prevalence of this disorder and assess awareness among females of childbearing age in Lebanon.

Methods: This was a descriptive, randomized and multi-center study conducted from February till May 2017. Females of reproductive age were recruited from different community pharmacies and gynecologic clinics in Lebanon. Women with neuropsychiatric disorders were excluded from this study. The primary endpoint was the determination of prevalence of PCOS. The secondary endpoint was the assessment of women’s awareness of PCOS. Standardized questionnaire was designed to reveal a history of PCOS and knowledge about complications and symptoms. Statistical analysis was done using statistical package for social sciences (SPSS) version 23 and data were analysed by using frequencies and chi-square tests and expressed as percentages and proportions. Informed consent was obtained of each participant and the Institutional Review Board (IRB) approved the study design.

Results: A total number of three-hundred females were screened from different centers and only two-hundred-eighty-five of them were enrolled in this study. Among these subjects, eighty-three (29.1%) participants had a history of PCOS, twenty-three (8.1%) worked in the medical field and forty-seven (16.5%) were unaware of this disorder. Female’s awareness about the disease complications was the highest for diabetes (48/285) followed by venous thromboembolism (42/285) and the least was for cardiovascular complications (39/285). Also, the symptoms awareness was assessed and the highest level was for irregular menses (193/285) followed by infertility (181/285), then excess hair growth (142/285), and the least...
level was for acne (115/285). Significant differences were noted between females involved in the medical field versus non-medical field regarding the knowledge of the disease complications and symptoms. Where the perception of venous thromboembolism, cardiovascular and diabetes complications was 4.6, 4.3 and 1.9 times respectively higher in women involved in the medical field; also for symptoms such as acne, excess hair growth and irregular menses, it was 1.8, 1.6 and 1.15 times respectively higher in those subjects.

**Conclusion:** The findings of this study highlight the fact that most females lack the necessary information about PCOS due to various reasons; especially those who are not involved in the medical field. This demonstrates the need for raising community awareness about this complex disease through education programs and brochures. Also, this study confirmed the essential role a pharmacist has, as a provider of information about a disease state.
Submission Category: Women's Health

Session-Board Number: 7-161

Poster Title: Comparative effectiveness study of econazole and clotrimazole in the treatment of vulvovaginal candidiasis among pregnant women

Primary Author: Eiman Mohamed Arafa, Hamad Medical Corporation; Email: emohamed3@hamad.qa

Additional Author(s):

Purpose: To compare the effectiveness of clotrimazole and econazole for the treatment of vulvovaginal candidiasis in pregnancy.

Methods: We conducted a cohort observational retrospective study to evaluate the clinical and mycological effectiveness of clotrimazole 500 mg administered in the form of an intravaginal tablet weekly for 2 weeks versus econazole 150 mg administered in the form of an intravaginal suppository daily for 6 days in the treatment of VVC among pregnant women. The study was conducted at the Obstetrics and Gynecology Department at Alkhor Hospital, which is a member of the Hamad Medical Corporation in Qatar. Patients were included in the study if they were pregnant, had been clinically diagnosed with VVC after presenting for antenatal care, and were aged 18 years or older. Exclusion criteria were patients who were treated with antifungals other than clotrimazole or econazole, diabetic patients, patients on corticosteroids, patients treated concurrently for VVC of a different aetiology, or previous VVC diagnosis and treatment during pregnancy. Patients who received either medication for VVC were identified through prescriptions dispensed from the pharmacy. These prescriptions were reviewed retrospectively from the period of May 2015 through August 2015 by a pharmacist and pharmacy technicians. Profiles of patients meeting the inclusion and exclusion criteria were evaluated at the first visit when they were diagnosed with VVC and received treatment and again at the second and third visit (after two and four weeks, respectively).

Results: A total of 129 pregnant women with symptoms of VVC were included in this study. Sixty-four patients were treated with clotrimazole and 65 were treated with econazole. There were no significant differences between the two groups in any of the demographics or culture results at baseline. A review of the clinical status of patients at two weeks indicated that all patients were followed-up. Fifty-eight of 65 econazole-treated patients (89.2%) were cured, which was a significantly higher cure rate than that for the clotrimazole-treated patients.
(47/64, 73.4%; P = 0.04). At four weeks, 54 of 65 econazole-treated patients (83%) patients remained asymptomatic. However, only 42 of 64 clotrimazole-treated patients (65.6%) remained asymptomatic. Only 21 of 129 (16%) patients were subjected to follow-up high vaginal swab. Of those, nine patients (42.9%) were in the clotrimazole group and 12 patients (57.1%) were in the econazole group. Of the nine patients treated with clotrimazole, four (44.4%) were culture-negative compared with six of 12 econazole-treated patients (50%).

**Conclusion:** In conclusion, treatment with econazole resulted in a significantly higher clinical cure rate and may be considered an effective alternative to clotrimazole, which has been used extensively in the treatment of VVC.