

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 1-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Impact of distance education on students' performance and course satisfaction

Primary Author:

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Purpose: To assess whether distance education has an impact on pharmacy students' overall grade compared to the traditional live main campus lectures for an Infectious Diseases course. Further, to assess the perceived course satisfaction of distant education students compared with the live main campus students' satisfaction.

Methods: An unannounced survey evaluating the students' perceptions of the course and their general knowledge base of infectious diseases was administered on the first and last days of class. A final multiple-choice assessment of detailed infectious disease information was administered at the end of the course to both distant learning students and live main campus students; final course grades were recorded, separated by campus, then blinded before analysis was performed. The primary outcome, to compare the assessment scores and course grades between the main and distance campuses, were examined using the two-sample t-test. Secondary outcome, the assessment of perceived course satisfaction, was examined with variety of nonparametric tests. Tests were two-tailed with significance < 0.05 .

Results: Students on the main campus achieved a significantly higher score on the end-of-course final assessment compared to students on the distance education campus (77% vs. 68%; $p=0.04$) and had higher final course grades (87% vs. 81%; $p=0.02$). Students on both campuses reported significant self-perceived improvement in their knowledge base regarding various aspects of Infectious Diseases ($p < 0.05$). Compared to the students on the distance campus, those on the main campus were more likely to be satisfied with the number of credit hours allotted for the course ($p < 0.001$) and to feel that they have succeeded in the course ($p=0.039$).

2016 Summer Meetings Poster Abstracts

Conclusion: The advancement of technology has led to the ability to increase our distance education programs within colleges of pharmacy. However, our study in one course suggests that students on the distance learning campus were not as successful in the course and had lower levels of course satisfaction compared to students on the main campus. As we continue to use distance learning to expand our pharmacy footprint, we must make sure we are evaluating our delivery of quality education to all of our student pharmacists.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 2-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Successful implementation of a hypercalcemia management guideline to curb inappropriate use of injectable calcitonin across a large health-system

Primary Author:

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Purpose: Mitigating the impact of high cost medications is an unfortunate necessity of all healthcare facilities. Injectable calcitonin experienced a more than one thousand percent increase which prompted the health system to review its utilization across inpatient facilities. Its use varied greatly representing an opportunity to review current literature and provide recommendations to improve and standardize care. This describes one process to the creation of a guideline and toolkit for implementation of the evidence-based acute management of hypercalcemia in adults with a goal of reducing procurement of injectable calcitonin by thirty-five percent while still maintaining optimum patient care.

Methods: An expert group of multidisciplinary clinicians convened to develop a system-wide guideline for the acute management of hypercalcemia in the adult population. The group reviewed primary literature and current guideline recommendations to develop an health system specific guideline for the acute treatment of hypercalcemia which included guidance on the appropriate place in therapy of injectable calcitonin, specifically to limit its use to symptomatic hypercalcemia. Supplemental materials included an easy to follow treatment algorithm and a frequently asked questions document to aid pharmacists in discussions with prescribers. This work was presented to the health system executive and clinical leadership for approval followed by a ninety day deadline for implementation across the system. An alert was created within the clinical decision support and surveillance tool to support this initiative. An achievable and reasonable compliance metric was developed from days of therapy of injectable calcitonin retrieved from billing data and incorporated into a red-green dashboard for

2016 Summer Meetings Poster Abstracts

monitoring. A resource at the health-system level serves as a point of contact for sites that require local support on the initiative.

Results: A guideline and toolkit for the acute management of hypercalcemia in the adult patient was created and implemented across the health system. Review of the literature identified that for most cases, the appropriate use of injectable calcitonin for the indication of hypercalcemia is limited to symptomatic patients for a maximum of forty-eight hours, after which point tachyphylaxis occurs and efficacy diminishes. All sites within the health system have achieved a thirty-five percent reduction in the procurement of injectable calcitonin. Monthly monitoring of the red-green dashboard ensures compliance with the initiative. The alert built within the clinical surveillance tool provides insight into additional savings opportunities beyond the thirty-five percent threshold.

Conclusion: Unexpected price escalations of medications will continue to challenge the viability of healthcare facilities until legislation is passed to alleviate this problem. Effective cost containment strategies are a must but cannot come at the expense of patient care. The key elements to the success of this strategy were the creation of useful, easy to use, evidence-based tools; the acquisition of buy-in and support from key leaders within the organization; the generation and monitoring of achievable, yet meaningful success metrics; and the provision of support when necessary.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 3-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Development of a business plan for a health-system based pharmacy technician training program suitable for ASHP accreditation

Primary Author:

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Purpose: As the profession of pharmacy continues to move beyond its traditional roles, the progressive utilization of technicians has become increasingly necessary. With this role expansion comes a need for more advanced training though completion of a reliable pharmacy technician training program. We sought to develop a business plan to implement an institutionally focused, ASHP accredited technician training program in order to ensure the high quality of education needed to support patient safety and an advanced pharmacy practice model as well as avoid some of the costs associated with technician turnover and a traditional training model.

Methods: Existing health-system based pharmacy technician training programs have reported significant decreases in turnover for those individuals that have completed an ASHP accredited training program versus those that have not. To estimate the cost associated with training a new technician, a training period of six weeks (240 hours) was used. To calculate the cost avoidance of technician turnover, based on our institution's human resources department's hiring process, an estimate of eight weeks (320 hours) was used as the time required to find, interview, and onboard a new pharmacy technician. An overtime pay rate of 1.5 times base pay was used in calculating the cost of technician turnover due to the fact that an existing technician would need to work beyond a normal forty hour week to ensure coverage of vacant shifts. A base pay rate of \$20 per hour was used along with an additional 30% of base pay to account for employee benefits, including non-productive time.

Results: The pharmacy technician training program implementation was considered cost neutral because all didactic, simulated and experiential instruction will be conducted by current

2016 Summer Meetings Poster Abstracts

employees during normal business hours. Based on the need for 320 hours over eight weeks of overtime coverage required to staff shifts, which are left vacant by technicians who leave, there is an estimated cost avoidance of \$11,520 per technician not turned over. Unlike our institution's traditional training model, technicians trained through an ASHP accredited program are not paid during the course of their training. This results in an additional estimated cost avoidance of \$1,512 per technician trained. Furthermore, technicians are responsible for paying a onetime fee of \$3,000 for training program tuition. Overall, estimated cost avoidance and payment received for tuition totals \$16,032.

Conclusion: In order to successfully develop a business plan to implement a health-system based pharmacy technician training program suitable for ASHP accreditation, a clear benefit in patient safety, advancing the pharmacy practice model, and a cost avoidance compared to our institution's current practice needed to be demonstrated. Based on reports from existing institutionally based training programs, retention of pharmacy technicians is greatly increased among individuals that graduate from an ASHP accredited training program versus those that do not. We estimate that our institution will make or avoid spending approximately \$16,000 per hired pharmacy technician who graduates from our newly established program.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 4-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Provider referral practices in response to implementation of an interprofessional transition-of-care program for high-risk patients

Primary Author:

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Purpose: Medication complications are responsible for an estimated 20 percent of hospital readmissions in the United States. To help address this problem, innovative, interprofessional Transition-of-Care (TOC) programs are being implemented. To date, little is known about how such programs influence provider referral practices. The purpose of this project was to examine providers' hospital referral practices; and evaluate the impact of an interprofessional TOC program on referral preferences.

Methods: An interprofessional, pharmacist- and nurse-managed Discharge Companion (DC) Program was initiated in a community hospital providing services to high-risk patients; follow-up occurred at 1- and 3-weeks post discharge. From November 2015 to March 2016; a sample of providers practicing within close proximity (8-mile radius) to the studied hospital were surveyed. Online survey links were emailed to potential participants. All responses to the questionnaire items were anonymous. Questionnaire items included: (1) provider characteristics; (2) current referral practice and motivational factors influencing this practice; (3) familiarity with the DC Program and potential changes in referral practices as a result; and (4) additional suggestions on current DC program. Qualitative analysis included use of grounded theory coding methods to generate themes from open-ended questions. Coding was completed by one researcher and verified by a second; a third researcher ensured accurate interpretation of responses. Thematic analysis of coding was used to identify patterns, trends, shared beliefs, and unanticipated items.

2016 Summer Meetings Poster Abstracts

Results: Of the 500 emailed providers, 56 completed the questionnaire (11 percent response rate). Commonly reported practice settings included: family medicine (34 percent); pediatrics (23 percent); and internal medicine (16 percent). Over half of respondents practiced for more than 10 years and 69 percent reported having professional autonomy in referring patients to hospitals. Most providers cited hospital-related factors for referral reasons. These factors included: (1) availability of specialist services; (2) hospital proximity; and (3) contracted hospitals. Other provider-related factors included: (1) prior personal or patient experience at the hospital; and (2) established communication channels with hospital personnel. Patient-related factors included: (1) patient or family hospital preference; and (2) covered insurance services. Most providers were motivated to refer patients to hospitals offering: (1) broader range of available specialists; (2) higher quality of care; and (3) better overall communication along with post-discharge electronic health record access. After learning about the program, 89 percent were more likely to refer patients to hospitals with this service. Respondents mainly cited added service, benefit and quality of care as reasons for likely referrals followed by improving medication utilization and preventing medication errors. Project results will be shared with the community hospital to help optimize this program.

Conclusion: The findings from this quality improvement project provide insight into providers' hospital referral practices. Additionally, these results suggest that the availability of this DC program may influence provider' future referral practices.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 5-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Transitions of care: Pharmacists in ambulatory setting reduce readmission rate by 80%

Primary Author:

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Purpose: The transition from an acute hospitalization to a patient's home can be a very overwhelming and critical time period. Patients are likely to experience confusion with discharge instructions, medication concerns, insurance coverage issues, and an overall lack of care coordinator during the busy transition from discharge to home. This multidisciplinary initiative was designed to better coordinate the care we provide our patients discharged from the hospital, while filling in any gaps patients and caregivers may experience. The goal of the program is to reduce 30-day hospital readmission rates, and improve patient and provider satisfaction with the transition of care.

Methods: Our ambulatory pharmacy team consists of two clinical pharmacists and three post-graduate (PGY1) residents completing a longitudinal ambulatory learning experience. The pharmacy team works four hours per day, five days per week, in our Family Medicine office, a teaching medical home model with a patient-load of 100 patients per day. Care Management triages and provides a daily list of high-risk patients discharged from our hospital. The pharmacist reviews both the hospital electronic medical record (EMR) as well as the ambulatory office EMR to gather necessary information. After reviewing progress notes, medication lists, labs, and any other pertinent information, the pharmacist calls the patient within 48 hours of hospital discharge. The pharmacist completes medication reconciliation, answers any questions the patient or caregiver may have, and provides patient education via telephone. The Pharmacist also offers care coordination support, ensuring the patient was able to obtain medications, received the appropriate laboratory tests orders , and was able to schedule all

2016 Summer Meetings Poster Abstracts

physician and specialist appointments in a timely manner. The pharmacist then documents the intervention in the medical record and sends the progress note with any additional recommendations to the care manager and the primary care provider. Issues requiring escalation or clarification are done immediately via face-to-face discussion with the appropriate prescriber.

Results: Of the 37 patients that spoke with our clinical pharmacists, only one patient was re-admitted to the hospital within 30 days, representing a 2.7% readmission rate. The 30-day hospital readmission rate for the office was 12.6% in the previous calendar-year, representing an 80% reduction in the 30-day readmission rate. Of note, the one readmitted patient had declined speaking with a pharmacist. Several missed opportunities, including cardiac-medications omitted on the first hospital discharge, lead to the patient being re-admitted for a myocardial infarction within weeks.

Conclusion: A multidisciplinary approach, including clinical pharmacists, is needed to ensure a safe transition from a hospitalization back to a patient's home. Our initiative has exceeded the reduction in readmission rates shown in the literature. demonstrating that a pharmacist involvement in transitions of care may significantly reduce 30-day hospital readmission rates.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 6-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Pharmacist impact on health literacy scores in a heart failure transitional care program at a large academic medical center

Primary Author:

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Purpose: Heart failure (HF) patients are faced with complex treatment plans that include medications, diet and lifestyle changes and the need for symptom recognition. Patient education is crucial in preparing patients and caregivers to manage this multifaceted treatment plan. Past efforts have shown that upwards of 20% of heart failure patients have low health literacy, which can be linked to increased mortality and hospital readmissions. Recognizing these challenges and deficits in our system, a process was developed to assess patients' health literacy and heart failure knowledge, allowing the multidisciplinary team to customize an education plan tailored to the patients' individual needs.

Methods: A retrospective cohort study design was used to assess the impact of pharmacist involvement in transitions of care and education, on patients' knowledge scores, health outcomes and satisfaction. Patients admitted to a unit where a validated health literacy questionnaire and the Atlanta Heart Failure Knowledge Assessment Test (AHFKT-VQ) are administered were included. Patients who scored less than 67% on the medications section of AHFKT-VQ, triggered a consult for pharmacist education as well as a follow up with an outpatient pharmacist. A post education knowledge test is then administered to evaluate improvement in patients' knowledge. Factors collected will include patient demographics, education level, AHFKT-VQ scores, average length of stay, 30-day all cause readmissions and ED visits to list a few.

2016 Summer Meetings Poster Abstracts

Results: During the study period, January through February, 24 patients received baseline teaching and the Atlanta Heart Failure Knowledge Assessment Test (AHFKT-VQ). Of the 24 patients 15 patients received a scored less than 67% on the pharmacy portion of the exam, which qualified them for pharmacy intervention. All 15 patients received pharmacist education inpatient and had a discharge medication reconciliation completed. 9 patients received 48 hour transition of care phone call from the pharmacist, 2 patients required additional follow up via phone. A total of 7 patients follow up in clinic with a pharmacist for additional education and re- administration of the pharmacy portion of the AHFKT-VQ. All 7 patients had a statistically significant increase in their knowledge score. Readmission rates and likelihood to recommend scores improved in the study population.

Conclusion: Pharmacists may be able to target resources and provide intensive intervention during transition of care of heart failure patients . Further study is needed to elucidate the impact of education level on the likelihood of decreasing patient readmission rates a improving patient adherence.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 7-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Development of a structured approach to remote medication management for patients in an accountable care organization at high risk of adverse outcomes due to polypharmacy

Primary Author:

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Purpose: As more patients gain access to healthcare, a systematic approach to identifying inappropriate medications is needed to manage large patient populations. In an accountable care organization (ACO), the need for optimal medication use is further highlighted as patient outcomes are directly linked to reimbursement. Pharmacists have an integral role in medication management; however, there is limited information available about specific approaches to review and identify suboptimal medication use. Given the large number of patients serviced by our ACO, the ambulatory care pharmacists believe the development of a systematic approach to medication management is needed to obtain specific and reproducible outcomes.

Methods: In an attempt to standardize an otherwise subjective chart review, two ambulatory care clinical pharmacy specialists were tasked with developing materials to evaluate medication use for the highest risk, highest utilizers within the ACO. These materials would serve as a template for medication review and also standardize the recommendations made to primary care providers. First, the pharmacists identified the most prevalent disease states in the ACO population that inevitably lead to multiple medications being used or high risk for emergency department or hospital admission if used inappropriately. Once these disease states were determined, the pharmacists identified objective characteristics to evaluate adherence, control, and medication safety (such as laboratory results, vitals, and prescription fill history). These criteria were derived from evidence-based guidelines and established quality metrics. For medications not grouped into a pre-identified high risk disease state, it was determined that the Medication Appropriateness Index (MAI) could be used for additional review if modified for efficiency. In an attempt to capture unmet preventive health needs, general wellness and prevention guidelines were also included. Topical, ophthalmic, and otic products were not

2016 Summer Meetings Poster Abstracts

included in the development of these materials. Final materials were evaluated by additional members of the ambulatory care team to ensure accuracy and completeness of reviews.

Results: Eight detailed medication review algorithms were developed. These algorithms assessed the appropriateness of treatments for anticoagulation, cardiology, dual antiplatelet treatment, chronic pain, diabetes mellitus, respiratory disorders, wellness, and a general medication review. The general medication review was a modified MAI reduced to 9 scoreable questions. Each algorithm directs the reviewer to specific recommendations based on the presence or absence of objective criteria. Recommendations may lead to adding, removing, intensifying, or de-escalating therapy; referral to specialist, including pharmacist for in-person disease state management visit; or additional laboratory monitoring. Upon completing the necessary algorithms a summary document is compiled to streamline the recommendations made to primary providers.

Conclusion: The development of a standardized, objective process for reviewing a patient's medications and medical records can improve efficiency in reviewing and providing recommendations to providers. This improved efficiency will enable the pharmacist team to broaden its patient reach in a high volume ACO. Future possibilities include evaluating the outcomes of the algorithm and accepted interventions, as well as utilizing the algorithms in additional pharmacy personnel such as residents and students.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 8-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Clinical outcomes of implementing decision support tools to reduce the number of patients at highest risk for hypoglycemia: One year later

Primary Author:

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Purpose: Studies show that insulin and sulfonylureas are a leading cause of hospitalizations in elderly. Further, the American Geriatrics Society recently partnered with the Choosing Wisely Initiative to promote moderate glycemic control in older adults. As a result, a clinical decision support tool was developed to assist providers in evaluating the risks and benefits of tight glycemic control in patients at highest risk for hypoglycemia. The primary objective is determining the percent of patients with therapy relaxed, and the change in hemoglobin A1c of the screened and unscreened patients. Secondary objectives are determining the incidence, frequency, and severity of hypoglycemia.

Methods: A clinical decision support tool was developed to facilitate the screening of patients at highest risk for hypoglycemia. This tool integrates electronic medical record information and comes due on patients with predefined high risk characteristics. High risk was defined as hemoglobin A1c < 6.5, on insulin or sulfonylurea, and the following characteristics: age \geq 75 years, eGFR \leq 30 ml/min, or dementia or cognitive impairment diagnosis. Providers are prompted to document the incidence, frequency and severity of recent hypoglycemic episodes, hypoglycemia-related visits and management strategy. The data generated from the tool is transformed and stored in a SQL Management Studio centralized data warehouse, and summarized using descriptive statistics.

Of the screened patients, those with a repeat hemoglobin A1C at least 2 months after being screened were included in a retrospective matched cohort study designed to evaluate the change in hemoglobin A1c of the screened patients compared to a similar group not screened. The groups were matched based on gender, age, presence of renal dysfunction, and cognitive

2016 Summer Meetings Poster Abstracts

impairment or dementia diagnosis. A two-sample t-test with equal variance was used to test for statistical significance of the mean hemoglobin A1c change between the two groups. Statistical significance was defined as a $P < 0.05$ (two-tailed). All analyses were done using Microsoft Excel.

This study received IRB exemption as a quality improvement project.

Results: Using the clinical decision support tool, 1,759 high risk patients (N=3,156) were screened for hypoglycemia. Of those screened, 20 % had their therapy relaxed either by discontinuing the insulin or sulfonylurea or reducing the dose. This rate increased to 45 % for patients reporting hypoglycemia. Of those screened, a group of 615 patients met the inclusion criteria outlined above and were further analyzed. The mean change in hemoglobin A1c of those screened using the clinical reminder (0.61 %; 95% CI 0.55% - 0.69 %) was significantly greater than the mean change of the group not screened (-0.52 %; 95 % CI -0.59%- -0.46%) $p < 0.0005$.

Of those screened, 16 % reported hypoglycemic episodes. The most commonly reported hypoglycemia frequency was once or 2-3 times per month in the last 6 months. Four (4) % of the screened patients reported hypoglycemia related faintness and 2 % reported having a hypoglycemia related visit in the last 6 months

Conclusion: The decision support tool implemented was effective in screening 56 % of the high risk patients allowing relaxation of therapy in 20%. The use of the clinical support tool was associated with a statistically significant increase in hemoglobin A1c at least 2 months after screening in high risk patients. Secondary objectives were also impressive identifying a high incidence of hypoglycemic symptoms during patient assessment. More data will be available when the tool has been used to assess the entire population and the full cohort has follow-up hemoglobin A1c.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 9-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Pilot ambulatory care pharmacy service model to identify warfarin patients to transition to a direct oral anticoagulant

Primary Author:

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Purpose: Direct oral anticoagulants (DOACs) are alternatives to vitamin K antagonists (VKA) for the prevention of stroke or systemic embolism with non-valvular atrial fibrillation (NVAf) or treatment or prevention of venous thromboembolism (VTE). Standards of best practice are not well defined for the optimal identification and follow-up of VKA patients to transition to DOAC therapy. The purpose of this study is to optimize anticoagulation by developing a systematic process for identifying appropriate patients to transition to a DOAC and monitoring the safety and efficacy of oral anticoagulant therapy.

Methods: The population included internal medicine outpatient clinic patients currently on a VKA for prevention of stroke or systemic embolism with NVAf or treatment or prevention of VTE. Time in therapeutic range (TTR) less than 60 percent over one year, SAmE-TT2R2 score greater than 2, and other patient factors were considered to identify suboptimally controlled VKA patients for potential transition to a DOAC. The intervention entailed expanding clinical pharmacy support for DOACs to a currently-established VKA clinic service. Clinical pharmacists collaborated with the interdisciplinary team as well as the patient for shared decision-making regarding transition to DOAC. Patients transitioned to a DOAC were followed in clinic by clinical pharmacists in accordance with established guidelines. The outcome of this study was the prevalence of suboptimal VKA cases. Other reported outcomes included the ongoing total number of successful interventions, major bleeding events, treatment failures, and clinic TTR pre-post intervention.

Results: As of February 2016, four out of seven patients scheduled in VKA clinic who were identified as suboptimal VKA cases were transitioned to a DOAC. Provider acceptance rate was

2016 Summer Meetings Poster Abstracts

100 percent, which was credited to systematic patient identification coupled with team-based care. Two patients opted out of transitioning and one patient did not show for the clinic appointment. Challenges encountered included cost, patient comfortability with warfarin, and concern for safety on DOAC therapy.

Conclusion: A systematic process was successfully developed to identify and transition VKA candidates to DOAC therapy.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 10-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Best practices for pharmacy informatics project approval and workflow

Primary Author:

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Purpose: Initiatives to advance healthcare are often complex and prove difficult to execute. A business model known as the Medication Management Advancement Program (MMAAP) has been developed at the corporate office, developed based on the input and structure of clinical and project management experts. MMAAP workflows specifically address and prevent common issues experienced in product development. This allows pharmacy informatics projects to be requested, evaluated, and progress through development stages in a supportive and transparent environment. This process has proven itself to be an efficient and effective process and could be implemented at other sites to support pharmacy informatics project development.

Methods: Due to the many initiating factors of an informatics project, a layered request system was created to provide screening and triage. This ensures projects submitted have been vetted by approved informatics experts prior to submission. The project is then triaged to the appropriate group for evaluation on several different factors including system capability, resource availability, feasibility, and other metrics.

Projects approved for development become part of MMAAP. Next, projects are sent to an expert panel of informatics pharmacists for review and prioritization. Once prioritization is finalized, MMAAP projects begin as both clinical and technical members work in parallel to take the projects through cycles of requirement writing, development, and testing until the project is complete. Complex projects with impact to nurses, pharmacists, and physicians are sent for final review and approval to the Medication Management Advisory Board (MMAB), a multidisciplinary team of experts.

2016 Summer Meetings Poster Abstracts

A project completed and given approval then moves to pilot. MMAP members work closely with the pilot site to ensure the project is appropriately tested before moving to a live environment for finalization of pilot. MMAP members keep in close contact with the site during this phase of pilot to lend support where needed. Once all project members are satisfied with the pilot performance, it is delivered to all company sites and becomes available for use.

Results: Through the MMAP project workflow process 27 projects were completed in 2015 and an estimated 42 projects will be completed in 2016. Projects completed involved nurses, pharmacists, physicians, respiratory therapists, and administrative personnel as the end user of the varying projects. MMAP projects may be developed to meet needs of (but not limited to) regulatory issues, clinical updates/enhancements, research, support for non-pharmacy managed projects, new medication management projects / functionality, medication diversion prevention, support for other pharmacy business cases, medication reconciliation, and Meaningful Use. The size of projects completed through MMAP range from only a few hours to over 1200 hours of programming and project management time.

Conclusion: MMAP projects are medication management focused but still vary widely in purpose, content, and size showing that this process is flexible and dynamic enough to handle a large variety of projects. The quantity of projects is dependent on available resources, but output of high quality projects can be expected through this process. While MMAP is currently executed at a corporate level, it is a flexible model and could be scaled to apply at a site, division, or corporate level. The MMAP workflow process is an efficient and effective method for the development of pharmacy informatics initiatives.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 11-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: A comparison of an automated process versus a combined manual pick process in cart fill dispensing at an academic medical center

Primary Author:

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Purpose: To compare the accuracy of two different cart fill dispensing methods at The Ohio State University Wexner Medical Center (OSUWMC). At The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute, cart fill is performed twice daily using an automated unit-dose packaging and dispensing system (Swisslog PillPick). At OSUWMC University Hospital, cart fill is performed once daily using a combined manual pick process. This combined process involves technicians manually obtaining medications from storage bins of frequently-used medications and from a barcode-enabled rotating medication storage system (MedCarousel) followed by a pharmacist check.

Methods: During the automated cart fill process, Swisslog PillPick packages bulk medications by drawing individual tablets/capsules from a barcoded and radio-frequency identified pill canister into a unit-dose package. The package is then sealed and labeled with the corresponding drug information and barcode. The resulting unit-dose packages are dispensed on a plastic ring that contains a 24-hour supply of cart fill medications for a particular patient. Pharmacists are required to perform a quality assurance check on 5% of automated cart fill dispenses. During the combined manual pick cart fill process, technicians select medications from MedCarousel by entering the name of the desired medication into a central computer. MedCarousel then rotates to the designated medication's shelf and indicates the medication's location on the shelf with a light. Technicians then verify accurate selection by scanning barcodes. Pharmacists are required to check 100% of doses dispensed via this method. For both cart fill methods,

2016 Summer Meetings Poster Abstracts

dispensing errors are detected by technicians and pharmacists during the routine check processes and as doses are being staged for delivery. Errors are recorded in a paper log and then transcribed into Microsoft Excel. Errors from both cart fill processes were collected from July-December 2015, and the data was analyzed to compare error frequency and type.

Results: During the 6 month study period, the automated process dispensed a total of 324,951 cart fill medications, and the combined manual pick process dispensed a total of 166,589 cart fill medications. The total number of dispensing errors for each process during the study period was 52 (0.016%) and 429 (0.258%), respectively. There were two error types that were common to both processes: drug omitted from cart fill and wrong quantity of medication dispensed. The error rates for drug omitted were 0.0019% (automated) versus 0.0084% (combined manual pick), and the error rates for wrong amount were 0.0042% (automated) versus 0.0726% (combined manual pick). Errors unique to the automated process included broken or crushed doses (0.0054%) and package printing errors (0.0009%). Errors unique to the combined manual pick process included wrong drug selected (0.0522%), wrong formulation of the correct drug (0.0384%), wrong strength of the correct drug (0.0354%), and additional incorrect drug added to the cart fill (0.0018%).

Conclusion: The automated process had a lower rate of overall cart fill dispensing errors when compared to the combined manual pick process. The automated process also resulted in a lower error rate for each error type common to both processes. Thus, the automated process proved to be a more accurate method of cart fill dispensing. In addition, the automated process had zero instances in which the wrong drug or the wrong strength was selected. This decreases the likelihood of a patient receiving an incorrect medication or dose, which increases overall safety of the cart fill process.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 12-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Innovative analytic technology and program evaluation identifies transplant medication use evaluation (MUE) opportunities and cost savings

Primary Author:

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Matthew Rice

Jacob Smith

Purpose: To optimize drug stewardship and transplant outcomes, a pilot effort aimed to create a proactive, data-driven medication utilization evaluation (MUE) process. By streamlining external and internal data sources for clinicians, the goal was to facilitate objective evaluation of program performance and to identify opportunities prior to resident MUE projects. The program evaluation benchmarked financially strategic service lines with University Health System Consortium (UHC) top performer institutions across multiple patient care outcome measures including survival, length of stay, readmissions, and drug costs. Next, the pilot incorporated a novel business intelligence tool to accelerate the speed of investigation and monitoring intervention impact.

Methods: The pilot synchronized two complementary data elements: 1) external benchmarking for opportunity identification and 2) internal performance analysis using innovative self-reporting technology.

A benchmarking strategy was established using methodology developed by Dr. Brian O'Neal and colleagues for the UHC Clinical Data Base. Three transplant services, renal, liver, and cardiac, were evaluated across multiple patient care outcomes. Rather than relying on name recognition alone, staff developed a peer compare group based on top performance. For each procedure, top performers were selected primarily by mortality while factoring in patient acuity and volume. In contrast to evaluating single outcome measures in isolation, survival, length of stay, and readmissions were evaluated relative to drug costs. Program short and long term

2016 Summer Meetings Poster Abstracts

survival rates were compared to state and national averages in the Scientific Registry of Transplant Recipients (SRTR).

A novel web-based business intelligence tool facilitated clinician access to internal performance data. The system was chosen because of its ease of use for self-service reporting, quick visualizations, and low cost administration. The advantage of this tool lies in the ability for non-technical staff to customize criteria of interest, monitor progress, and rapidly investigate potential parameters contributing to the outcomes. Clinicians were trained on different user levels varying between the tradeoff from increased control and customizability as compared to the time investment to maintain competency with the tool.

Results: Clinical pharmacists identified four potential transplant resident MUE projects for the next academic year. Variable knowledge of program outcomes for these service lines became uniformly known.

Prior to the pilot, no reliable routine utilization reporting mechanism existed at the drug and service level to identify opportunity or demonstrate intervention results for all the clinician stakeholders. Using the business intelligence tool's highest customizable user level, one clinician with budgetary responsibility created a valuable cost savings monitoring report. The report quantified a liver transplant intervention that resulted in significant savings by switching administration of mycophenolate intravenously (IV) to by mouth (PO) in June 2014. By using PO instead of IV mycophenolate routinely post-operatively, the liver transplant service associated charges dropped 76 percent; charges averaging \$24,000 a month during August 2013 to May 2014 dipped to an average of \$5,700 per month during June 2014 to June 2015.

Based on user feedback, most clinicians did not prefer the highest customizable user level for the business intelligence tool. They anticipated minimal frequency of usage compared to a maximum time investment for maintaining competency. Clinicians preferred the mid-level user privileges with pre-designed interactive web-based reports filterable based on a few key parameters.

Conclusion: A data driven program evaluation presented a number of opportunities for more specific MUE inquiries. UHC and internal data sources that are based on inpatient billing enabled valuable comparisons between procedures, drug costs, and outcomes. However, it did not provide the granularity necessary for in-depth investigations of unique transplant classifications and testing results (e.g.: incompatible renal transplantation). Supplementary sources of information were required. Additionally, outpatient data was excluded to standardize comparisons from available sources of outcome information.

Self-service business intelligence introduced the potential to satisfy a myriad of utilization reporting needs in a cost effective manner.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 13-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Designing and implementing a discrete clinical note template in the electronic health record (EHR) to document outpatient pharmacist delivered ambulatory care services.

Primary Author:

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Joseph Simon

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Daniel Anzalone

Purpose: A patient care model was created and implemented at the University of Illinois Health System (UI Health). The model includes several standard of care components including coordinated synchronized medication processing, wellness and preventative care, Medication Therapy Management (MTM) and disease state management service (DSM) within the scope of the outpatient pharmacy setting. The outpatient pharmacists provide valuable patient care services that need to be documented in the EHR. A user friendly PowerNote was designed and implemented in the EHR to communicate the services mentioned above to the whole health care team in a highly visible location.

Methods: The EHR system was assessed for any existing tools that could serve the purpose of documenting pharmacy services. An existing electronic prepopulated form (Cerner PowerForm) was identified, however, it was significantly outdated. Initially a representative from pharmacy IT and operational leadership met with the EHR IT team to explore functionality and possibility of creating a new custom tool. Subsequently several end users and a clinician were engaged to gain their perspective and input. Based on these explorations a PowerNote was designed, created and implemented. Data was grouped based on theoretical and operational categories. The PowerNote was created to retrieve and auto populate most standard data such as allergies, diagnosis, medication list and social history from the EHR to save time and user effort. Most common pharmacists interventions were also programmed as selectable data fields in the tool to minimize manual data entry. The tool also facilitates data reporting. The tool was piloted and incorporated into outpatient pharmacy operations.

2016 Summer Meetings Poster Abstracts

Results: The PowerNote was designed to house documentation related to visit information, health status, medication reconciliation, histories, adherence, comprehensive medication review and pharmacy based disease state management services. It is being used by fifteen pharmacists in five ambulatory care pharmacies in a health system. A total of 2350 powered notes were generated using this tool over a six and half month period spanning from Mid-June to December 31, 2015. The tool allows for reporting and data mining. The creation of this note allows us to track and mine the data generated from documented pharmacist delivered services. It also will facilitate the study of these patient encounters and services

Conclusion: A discrete clinical note template that is customized to the specific services provided by ambulatory care pharmacies can provide a user friendly, and efficient method to document patient care services delivered in an outpatient pharmacy setting. The tool also serves as a guide and algorithm to document pharmacist delivered services. These documentations can also help with billing and articulation of the value of pharmacists as care providers. This record in turn would also add to the meaningful use of the EHR by other pharmacists, providers and ultimately add meaning to comprehensive and coordinated patient care.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 14-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Unexpected findings with the implementation of modern smart infusion pumps

Primary Author:

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Mark Chabot

Case Report: This case study outlines the challenges and benefits of converting to a modern smart infusion pump. In 2015, our health system lost technical and hardware support from the manufacturer of our large volume infusion (LVI) pump, prompting our organization to find suitable replacements. This case report discusses the challenges experienced with necessary modifications for interoperability performance, technical limitations, and the benefits of wireless connectivity found in contemporary smart infusion systems. When transferring the previous medication libraries into the new infusion system, inconsistencies were found. Our previous pediatric library organized medications by concentrations whereas the adult library organized medications by the total volume of mixture. In order to ensure the performance of interoperability with our electronic medical record (EMR), each medication transferred into the new infusion system library was required to include every associated dose and volume size. The initial conversion of the medication libraries required approximately 70 days to complete. A major software limitation that was identified during the initial implementation process was the inability for end-users to switch between profiles once the pump was activated. In order to switch between profiles, the end-user is forced restart the pump and concurrently risk disrupting therapy. This limitation hampered our initial concept of creating profiles based upon patient care units. In total, 1,119 individual datasets were eventually migrated to our new infusion system and partitioned into an adult, pediatric, and neonatal profile. Three profiles were specifically developed in order to capture all patient types in as few profiles as needed, therefore decreasing the need to switch libraries. A new feature of contemporary infusion systems includes wireless connectivity, this allows the pharmacy department to integrate provisional study medications into the drug library in an efficient manner and ensure their safe

2016 Summer Meetings Poster Abstracts

administration. With our previous pumps, updating drug libraries was a labor intensive and time-consuming process. A member of the clinical engineering staff with the use of a laptop and a communications cable manually updated each individual pump. Historically, the turnaround time for updating the libraries of every pump within our institution was estimated to be one to three months. Wireless connectivity has shortened it to less than 24 hours. During the build of the neonatal library, a significant technical limitation was found in syringe module of the new infusion system. Our previous syringe pump allowed minimum flow rates of 0.01 mL per hour, while the new infusion system limited the minimum flow to 0.1 mL per hour for syringes 5 mL or larger. This limitation initially affected 40 percent of the medications in neonatal continuous infusion library, requiring some to be dispensed in 3 mL syringes. Another technical limitation was associated with the PCA module of the new infusion system as it enforced a delivery limit of less than 35 percent of the total syringe volume per hour. Since our previous PCA pump was also used to provide continuous infusions of controlled medications, the pharmacy department was required to expand its formulary from five controlled medication cassettes to four PCA pre-filled syringes and four pre-mixed bags. This adjustment will affect approximately 23,000 dispenses per year. Ultimately, the implementation of our modern smart infusion system required restructured pump libraries and adjustments to medication records within our EMR to activate interoperability. Software design limitations were addressed through the use of broad patient profiles. The ability to efficiently update medication libraries via wireless connectivity allowed the pharmacy department to include medications of brief formulary status. Challenges associated with the infusion systems technical limitations were resolved through workflow and formulary modifications.

2016 Summer Meetings Poster Abstracts

Submission Category: Clinical Services Management

Session-Board Number: 15-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Development of a transitions of care pharmacist tool to predict 30-day rehospitalization

Primary Author:

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Purpose: The risk of 30-day rehospitalization is common and expensive. Existing rehospitalization risk prediction models use complex scores not calculable prior to discharge and do not use variables readily available to pharmacists. Pharmacist-managed transitional care services are effective in reducing rehospitalization rates. However, models specifically created for use by transitions of care pharmacists before discharge to target their continued services are needed. The objectives of this study are to 1) identify factors associated with an increased risk of 30-day rehospitalization, and 2) develop a practical prediction tool for use by pharmacists to target enrollment in continued outpatient transitions of care services.

Methods: Our retrospective, institutional review board-approved study was comprised of a cohort of 200 patients at Lifespan who had an initial encounter with an inpatient transitions of care pharmacist. Data were extracted from transitions of care pharmacy notes and an electronic medical record. The primary outcome was the first unplanned rehospitalization to any Lifespan-affiliated facility within 30-days of discharge. Patients who were 18 years of age or older and admitted to the hospital between December 4th, 2013 and September 30th, 2015 were included. Patients who died within 30 days of hospital discharge were excluded. Univariable and multivariable logistic regression with robust standard errors clustered by patient were used to identify predictors of 30-day rehospitalization and develop a prediction tool. We assessed the following predictors in our regression model: admission characteristics, demographics, previous healthcare utilization, comorbidities, medication history, and

2016 Summer Meetings Poster Abstracts

transitions of care pharmacist encounter characteristics. Discrimination of our model was assessed using the c-statistic.

Results: Mean age of the study cohort was 65.6 years and 43 percent were male. Greater than half of the subjects had six or more chronic conditions and were taking ten or more medications at baseline. The overall risk of 30-day readmission was 26.4 percent (95 percent confidence interval [CI]: 19.7-35.2 percent). Predictors of rehospitalization in the multivariable model included the number of medications at time of admission (OR 1.17; 95 percent CI 1.04-1.33), commercial insurance coverage (versus Medicare, OR 0.28; 95 percent CI 0.07-1.08), pharmacist contact with the patient's prescriber (OR 0.44; 95 percent CI 0.19-0.99), and the amount of time the transitions of care pharmacist spent with the patient (46 to 129 versus 45 or less minutes, OR 0.19; 95 percent CI 0.05-0.81). Number and severity of medication-related problems identified by the transitions of care pharmacist were not strong predictors of rehospitalization. The c-statistic of the model was 0.74. A 25% threshold of predicted risk of 30-day rehospitalization identified 40.4% of patients as high priority for continued transitions of care services, while a 40% threshold identified 16.2% of patients as highest priority.

Conclusion: These findings suggest that patients taking many medications who do not have a comprehensive encounter with a transitions of care pharmacist have the highest risk of 30-day rehospitalization. Our prediction tool has good discriminative ability and may assist transitions of care pharmacists with selection of patients for additional post-discharge follow-up and care to avoid rehospitalizations.

2016 Summer Meetings Poster Abstracts

Submission Category: Clinical Services Management

Session-Board Number: 16-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Studies on the roles of transplant pharmacists in organ transplant team - Roles of pharmacist in organ transplant team preparing for the first case

Primary Author:

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Purpose: Veterans health service medical center -which has been developing to public medical service facility-is preparing for the organ transplanting service as one important step for upgrading to upper class hospital. For this, task force team was set up and department of pharmacy also participated in it.

This study is to investigate the list of preparation works which has to be performed by department of pharmacy for the first transplant, and to identify the roles of transplant pharmacist and pharmaceutical services for the patient after the operation as a member of transplant team.

Methods: In August 2014, the preparation meeting for the first organ transplantation was held among related departments. In September in the same year, task force team for transplant implementation was established, and overall preparation started off. Department of pharmacy was responsible for preparation of medicine required for transplantation. The department started the set-up of electronic medical record(EMR) systems - coding - and placed orders for medicine required after extensive evaluation and investigations.

Finally, preparation for organ transplantation had been finished among departments related. The patient for the first case was a 66-year-old male patient whose disease was chronic kidney disease on stage 4. Several inspections such as HLA-type-matching were carried out.

In Jan. 2015, after all, the first case - kidney transplantation - was performed successfully. After the surgery, proper dosage and usage of medicine should be considered in order to prevent

2016 Summer Meetings Poster Abstracts

adverse reactions such as infections and some complications following transplant surgery. And the patient wondered especially about intricate and complicated medication. This led transplant pharmacist to provide medication education and patient counseling through daily visits. The pharmacist continuously explained altered dosage when happened, based on the result of daily therapeutic drug monitoring(TDM) and provided individual medication time table to patient, his family and nursing care team.

Results: Transplant pharmacist prepared the medicine for immunosuppressants, preserve solution for surgery, anti-infective agents which were necessary for transplantation. During this process, Transplant pharmacist – as a representative of department of pharmacy – actively involved in collecting & sharing opinions and information among task force team members (transplant surgeon or coordinating nurse, especially).

Pharmacist visited the patient everyday from the next day of operation to give an education about medicine prescribed, including immunosuppressants. Proper understanding of medicine by the patient leads to the willingness to precise compliance – which is crucial for success of organ transplant.

There are many aspects should be considered in medication such as polypharmacy, dosing, interval, drug-drug interaction, drug-food interaction, adverse events monitoring, blood sampling time for therapeutic drug monitoring(TDM), and more. Considering all above, Transplant pharmacist provided medication time table to patient and nursing team which was individualized to each patient for optimum medication therapy. This led patient's satisfaction of overall transplantation highly improved.

Conclusion: Transplant pharmacist, as a member of transplant team, performs important roles from the initial stage of preparation. In addition, Transplant pharmacist takes active part in patient care after transplantation for safe and effective medication which results in better cure and higher survival rate in the end. Medication counseling is considered as essential and supported by relevant contents in UNOS(United Network for Organ Sharing) ; Unfortunately, guideline about roles of pharmacist in organ transplantation field is currently not supported with appropriate objective data in domestic area yet. Therefore, the roles of transplant pharmacist shall be getting more highlighted.

2016 Summer Meetings Poster Abstracts

Submission Category: Critical Care

Session-Board Number: 17-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Impact of chlorhexidine bathing on hospital acquired clostridium difficile infection in a surgical intensive care unit

Primary Author:

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Purpose: In the CHlorhexidine Gluconate BATHing (CHG-BATH) randomized controlled trial, bathing with two percent chlorhexidine solution significantly decreased the risk of acquiring healthcare-associated infections (HAIs) in surgical intensive care unit (ICU) patients compared to soap and water bathing. Clostridium difficile, the most common HAI pathogen in ICU, was not included as a trial outcome. This study uses data from the CHG-BATH trial to evaluate an incident infectious outcome of Clostridium difficile infection (CDI). We hypothesize that compared with daily soap and water bathing, chlorhexidine bathing every other day decreases the risk of hospital-acquired CDI.

Methods: This study was approved and given a waiver of consent by the Institutional Review Board. Adult patients admitted to the 24-bed surgical ICU from July 2012 through May 2013 with an anticipated ICU stay for at least 48 hours were included. Patients were randomized to bathing with two percent chlorhexidine solution alternating with soap and water every other day or to bathing with soap and water daily for up to 28 days. Each included patient was retrospectively adjudicated by two independent blinded investigators for CDI outcome if they had a positive Clostridium difficile toxin, received an administrative billing code for CDI, received oral vancomycin or fidaxomicin, or had radiology evidence of pseudomembranous colitis. The primary outcome was the proportion of incident CDIs among patients who stayed in the study for at least 48 hours and did not have a prevalent CDI, compared between the two study arms. Using a two independent sample test of two proportions (Chi-squared test) power estimate with a fixed sample size of 325, two-sided alpha of 0.05, beta of 0.20, and estimated

2016 Summer Meetings Poster Abstracts

incidence of 8 percent in the control arm, this analysis would have 80 percent power to detect a 6.5 percent absolute risk reduction.

Results: Of 350 randomized patients, 325 were analyzed (164 soap and water versus 161 chlorhexidine). Thirty-eight patients (11.7 percent) met the criteria for a potential CDI and underwent adjudication for classification as no CDI, prevalent CDI, or incident CDI. For patients bathed with soap and water versus chlorhexidine, counts of incident CDIs were 2 versus 3; counts of prevalent CDIs were 6 versus 7. There were no significant difference in the incidence of CDIs between the two study arms (1.3 percent [2 of 152] soap and water versus 2.0 percent [3 of 148] chlorhexidine, $P=0.63$)

Conclusion: Compared with daily soap and water bathing, chlorhexidine bathing every other day did not decrease the risk of hospital-acquired CDI among surgical ICU patients. Given that the incidence of CDI (1.3 percent) observed in the control group was lower than what was expected in the riori power calculations (8 percent) , the study was not adequately powered to detect differences in the incidence of hospital acquired CDI.

2016 Summer Meetings Poster Abstracts

Submission Category: Drug Information

Session-Board Number: 18-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Strategic plan for preventing and mitigating drug shortages in Taiwan

Primary Author:

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Yueh Ching Chou

Purpose: The incidence of drug shortages has increased worldwide and also in Taiwan, which have caused numerous difficulties for clinicians, health care facilities, and patients. A management strategy that includes clear policies and procedures for information gathering, decision-making, collaboration, and timely communication should be established to effectively handle drug shortages. The Food and Drug Administration in Taiwan (TFDA) has conducted the “Management of Drug shortages in Taiwan” for four consecutive years to minimize the occurrence of drug shortage.

Methods: Since 2011, the Taiwan Society of Health system Pharmacists (TSHP) has undertaking the multi-year project of “Strategic Plan for Preventing and Mitigating Drug shortages” from TFDA. Over the past 4 years, the TSHP has continued to refine the contents of the platform on drug shortage website, updated the list of liaison officer from health institutes, local health authorities, pharmacists’ societies and associations, pharmaceutical distributors, and pharmaceutical manufactories, and renewed the list of experts to evaluate and discuss special cases. Apart from this, the TSHP has coped with several cases reported via internet, mail, telephone, or fax, analyzed the causes of drug shortage and posted the latest status and notice of drug shortage on website monthly for public reviewing. The TSHP has held several educational forums toward reporting and processing a drug shortage report to healthcare facilities and business firms in the North, Middle, and South regions of Taiwan. A number of group meetings and expert meetings have also been held to achieve the perfection of the strategic plan.

Results: Under the supervision of TFDA, this year TSHP has fulfilled 1. All drug shortage notices were posted on web in time, updated the list of liaison officer of total 323 contact persons, and established LINE chat group for liaison officers. 2. Up to present, 106 drug shortage reports

2016 Summer Meetings Poster Abstracts

were coped with. The recommended list of experts was also been renewed. 3. Six educational forums were held in order to advertise the report process. Three additional sections targeting the business firms were held and implemented before and after training questionnaire to evaluate the efficacy. 4. Three expert meetings were conducted to discuss the coordination of drug shortage and its strategy. 5. LINE chat group for Management of Drug Shortages liaison officers were established for faster information exchange and communication. 6. Drug shortage report form and add evaluation instruction were revised to improve the quality of evaluation.

Conclusion: The project not only can improve patients' right to get access to the appropriate medication clinically, but also minimize the impact of extra healthcare and cost due to drug shortage. Recommendations include the following: 1. The TFDA may establish strategic plans for manufactures delayed or neglected to report of drug shortage and have no intention in manufacturing due to any reason. 2. Refer to the drug shortage website from European Union, the United States, Canada to optimize our website features. 3. Encourage to hold consensus meetings for all evaluating pharmacists to discuss rules and exchange of experience to ensure consistency.

2016 Summer Meetings Poster Abstracts

Submission Category: Drug Information

Session-Board Number: 19-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Hypoglycemic effects of tramadol analgesia in hospitalized patients

Primary Author:

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Nancy Stolpman

Purpose: Hypoglycemia has been associated with tramadol therapy in individual case reports, toxicological case descriptions, and epidemiological outpatient surveys. The aim of this investigation was to determine the incidence of tramadol-related hypoglycemia in patients hospitalized at an academic medical center.

Methods: Inpatients who received one or more doses of tramadol during a recent 3-year period of observation were identified and their electronic medical records were retrospectively reviewed. Patients were included if they had blood or plasma glucose concentrations measured on at least two occasions within five days after the first administration of tramadol. Nadir glucose concentrations were recorded and the proportion of patients having a glucose measurement ≤ 70 mg/dL was calculated. Among hypoglycemic patients without a diabetes mellitus diagnosis, algorithmic causality evaluations were performed.

Results: During the period of observation, tramadol was administered to 2,927 patients who met inclusion criteria. Among these, hypoglycemia was recorded in 22 of 47 patients with type 1 diabetes (46.8%), 113 of 673 patients with type 2 diabetes (16.8%), and 103 of 2,207 patients who did not have a diabetes diagnosis (4.7%). In nondiabetic patients, a causal association between hypoglycemia and tramadol administration was possible in 1.2% of patients and probable in 3.5%. Nondiabetic patients with hypoglycemia probably caused by tramadol were comparatively young and 74% were female.

Conclusion: In hospitalized patients, tramadol use was associated with hypoglycemia. Diabetic patients may be at heightened risk for tramadol-related hypoglycemia. Blood glucose monitoring should be considered.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 20-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Clinical effects of the addition of strong CYP3A4 inhibitors to continuous intravenous infusion fentanyl

Primary Author:

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Purpose: The clinical effects of many drug-drug interactions (DDI) are poorly characterized in medical literature. The DDI between fentanyl or alfentanil and CYP3A4 inhibitors has been shown to cause significant increases of 1.5 to 6 times the area under the curve for medication exposure compared to control. This frequent DDI is often regarded as clinically insignificant, but little data is available to evaluate the true clinical effects. We hypothesized if the DDI was clinically significant, mechanically ventilated patients on fentanyl infusions would remain on ventilation longer if a strong CYP3A4 inhibitor was added compared to patients on only fentanyl.

Methods: This single center, retrospective study included adults of at least 18 years of age who were mechanically ventilated in the intensive care unit (ICU) and received a continuous intravenous infusion of fentanyl between September 1, 2014 and August 31, 2015. Baseline characteristics and endpoints were collected through manual chart review and a query of electronic health record data. Patients qualified for CYP3A4 inhibitor categorization if at least two doses of systemically administered erythromycin, clarithromycin or azole antifungals were administered while on fentanyl. Patients were excluded from evaluation if they received extracorporeal membrane oxygenation, care in the burn ICU, a fentanyl patient controlled analgesia device, or only one dose of a CYP3A4 inhibitor. A multivariable linear regression was used to evaluate the effect of CYP3A4 inhibitor use on total days of ventilation. The model was adjusted for several known and potential co-variables including hospital acquired pneumonia, acute kidney injury, age, body mass index, and use of multiple intravenous opioids. Secondary endpoints included the difference in length of stay, use of naloxone, total dose of fentanyl and

2016 Summer Meetings Poster Abstracts

total number of as needed (PRN) doses administered between the group of patients who received a strong CYP3A4 and those who did not received a strong CYP3A4 inhibitor.

Results: There were 1,017 patients identified for evaluation and 775 patients met inclusion criteria. Strong CYP3A4 inhibitors were used concomitantly with continuous intravenous fentanyl infusion in 97 patients. The majority of inhibitors were fluconazole (77%), follow by voriconazole (12%), and erythromycin (10%). Comparison of baseline characteristics showed patients in the CYP3A4 inhibitor group had a lower initial fentanyl dose (50.3 mcg/hr vs. 63.2 mcg/hr; $p < 0.001$) and were more likely to have acute kidney injury (60.8% vs. 40.6%; $p < 0.001$), receive propofol (85.6% vs. 72.4%; $p = 0.006$) or another scheduled intravenous opioid (55.7% vs. 35%; $p < 0.001$). The adjusted multivariable linear regression model demonstrated use of a CYP3A4 inhibitor was associated with a mean increase of 9.1 ventilation days (95%CI 6.9-11.2; R-squared = 0.1182). Those receiving a CYP3A4 inhibitor also had a longer length of stay (28.3 days vs 16.6 days; $p < 0.001$), a higher total dose of fentanyl (19,818.4 mcg vs 6,145.3 mcg; $p < 0.001$), and more PRN fentanyl doses administered (13 vs 7.1; $p = 0.002$). No difference in use of naloxone was detected between groups (4.1% vs 2.8%; $p = 0.516$).

Conclusion: This retrospective review indicates the potential for a clinically significant increase in fentanyl exposure from the DDI with strong CYP3A4 inhibitors, but contains many limitations. The CYP3A4 inhibitor group contained more patients who received other opioids. In addition, the indications for these CYP3A4 inhibitors are related to bacterial or fungal infections. These criteria may introduce systematic error to select for patients who were either more acutely ill or who have already received a significant length of ventilation. A larger, prospective evaluation is needed to fully elicit the effects of this potentially severe DDI.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 21-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Optimizing pharmacist medication reconciliation services to improve continuity of care for hospitalized patients discharged to a skilled nursing facility

Primary Author:

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Ron Floyd

Purpose: This was a descriptive study that evaluated the impact of remote pharmacy medication reconciliation services for patients admitted at Palomar Health (PH) that were discharged to a participating skilled nursing facility (SNF). Primary objectives of this study were: documentation of medication errors and interventions provided by a pharmacist and potential cost savings to SNFs associated with medication use and acquisition cost. Secondary objectives were: 30-day readmission rates and 30-day emergency care utilization.

Methods: The study intervention was a pharmacist performing comprehensive medication reconciliation remotely for patients who had been or were to be discharged to a participating SNF from PH between Fall 2015 to Spring 2016. Two SNFs were involved in the study, Villa Pomerado and Life Care Center of Escondido. The pharmacist provided services for approximately two half days per week. Patients were included if they were discharged from PH to a participating SNF. SNF patient information was sent via secure fax or e-mail. SNF and hospital records were reviewed by the pharmacist, who intervened by providing recommendations to the appropriate provider only to prevent harm or improve continuity of care.

Primary outcomes included documentation of medication errors defined by the National Coordinating Council for Medication Errors and Prevention (NCC MERP), interventions and discrepancies delineated by Truven categories used by PH, and potential cost savings for SNFs (calculated by drug acquisition cost) from interventions that would have eliminated

2016 Summer Meetings Poster Abstracts

unnecessary medications. Secondary outcomes included 30-day readmission and 30-day emergency care use.

Since this was a remote service with quality assurance efforts, informed consent was not required. This study was approved by the PH Institutional Review Board.

Results: 53 patients were included in this study. 20 medication errors were identified with the following MERP categories, 11 in A, 6 in B, and 3 in C.

A total of 26 interventions were made by the pharmacist and consisted of the following Truven categories: 16 drug order clarifications, 5 therapy optimization recommendations, and 5 adverse drug event prevention recommendations. Of the 26 interventions mentioned above, a total of 24 were identified as medication discrepancies and consisted of 15 of medium, 5 of high, and 4 of low clinical significance.

A total of 76 unnecessary medications were identified and calculated to a total of 8,566.10 dollars potential cost savings to SNFs. The top three unnecessary medications identified were ondansetron, bisacodyl suppository and milk of magnesia.

For the patients who have reached their post-discharge 30 day mark, the 30-day hospital readmissions and emergency care usages are approximately 33 percent and 22 percent respectively.

Conclusion: Comprehensive medication reconciliation services provided remotely by a pharmacist for two half-days per week improved transitions of care for hospitalized patients discharged to a SNF. The pharmacist identified 20 medication errors and performed 26 interventions. Cost savings to SNFs if unnecessary medications were prevented would have been 8,566.10 dollars. The impact on hospital readmissions and emergency service utilization is not clear at this time and warrants further evaluation. This innovative type of service should be considered for a larger study and perhaps permanent implementation with expanded hours to service more SNFs and additional personnel to help manage clerical duties.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 22-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Cocoa-flavored orally disintegrating rebamipide tablets for patient benefit

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Noriyuki Namiki

Purpose: Orally disintegrating tablets (ODTs), which are administered without water, are beneficial for patients with dysphagia and for the elderly. However, ODTs with an unpleasant bitter taste may result in poor adherence and thus influence treatment regimens and drug efficacy. Therefore, it is necessary to mask unpleasant tastes. In clinical practice, chocolate has been empirically recognized as a masking agent for unpleasant tastes. In this study, we prepared cocoa-containing ODTs of rebamipide, a therapeutic drug for gastric ulcers with a persistent bitter taste, and examined these ODTs in gustatory sensation tests using human volunteers.

Methods: Granule formulations containing rebamipide and D-mannitol were prepared and blended with Ludiflash (BASF Japan Ltd., Tokyo, Japan), 10 percent crospovidone, 2 percent sweeteners (aspartame and thaumatin) and 0, 2.5, 5, 10 percent cocoa powder (Ch0-ODTs, Ch2.5-ODTs, Ch5-ODTs, Ch10-ODTs, respectively). The mixture was prepared by a direct powder compression method using a tablet compressor (Handtub, Ichihashi, Seiki Co., Ltd., Kyoto, Japan). ODTs of rebamipide without cocoa powder, aspartame, and thaumatin were used as controls (Cont-ODTs). A gustatory sensation test was performed in 30 healthy adult volunteers (9 men and 21 women; age, 22.3 plus or minus 2.2 years [means plus or minus S.D.]) after they provided written informed consent. We used the 100-mm visual analog scale (VAS) to evaluate bitterness and overall palatability of Cont-ODTs, Ch0-ODTs, Ch2.5-ODTs, Ch5-ODTs, Ch10-ODTs. The volunteers had to place a mark along the scale after the tablets disintegrated in their oral cavities and just after spitting out the tablets. VAS bitterness scores of 0 and 100 meant “none” and “very bitter,” respectively, whereas VAS overall palatability scores of 0 and

2016 Summer Meetings Poster Abstracts

100 meant “bad” and “good,” respectively. At the same time, the acceptableness scores of ODTs were evaluated with five points. The study protocol was approved by the Ethics Committee of Hamamatsu University School of Medicine, Japan.

Results: The mean hardness and in vitro disintegration time of all ODTs tested were nearly 50 N (49.0–58.2 N) and less than 30 s (15.3–26.6 s), respectively. The disintegration time in vitro was found to increase with increasing amount of cocoa powder. The bitterness VAS scores during disintegration were not different among the ODTs except for Ch2.5-ODTs; the scores for bitterness during disintegration of Ch2.5-ODTs were significantly lower than that of Cont-ODTs and Ch0-ODTs. The VAS scores of ODTs containing sweeteners (Ch0-ODTs, Ch2.5-ODTs, Ch-5-ODTs and Ch10-ODTs) immediately after spitting out the ODTs were significantly lower than those of Cont-ODTs (without sweeteners). The overall palatability VAS scores for ODTs containing cocoa powder (Ch2.5-ODTs, Ch-5-ODTs, and Ch10-ODTs) during their disintegration were higher than those for Cont-ODTs and Ch0-ODTs. VAS scores of Ch0-ODTs, Ch2.5-ODTs, Ch-5-ODTs, and Ch10-ODTs just after spitting the ODTs were higher than those of Cont-ODTs. Based on the evaluation on a five-point scale, Ch2.5-ODTs and Ch10-ODTs were the most acceptable among all ODTs tested in this study.

Conclusion: Our results suggested that the bitterness of rebamipide ODTs with cocoa powder was suppressed both during their disintegration in the oral cavity and after spitting out, although ODTs with only sweeteners decreased the bitterness after spitting out. Cocoa powder improved the overall palatability during disintegration in the oral cavity. The Ch2.5-ODTs were the most suitable formulation. Thus, rebamipide ODTs containing cocoa powder, which can be easily prepared with the Handtub in a pharmacy, is beneficial for patients.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 23-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Pharmacy student involvement in the creation of an antibiogram within an acute rehabilitation hospital

Primary Author:

Farihah Amatullah, Magee Rehabilitation Hospital

Additional Author(s):

Dorela Priftanji

Purpose: Antibiograms are tools utilized in the selection of initial empiric antibiotic therapy for patients with unknown microbial antibiotic susceptibilities. Up to fifty percent of antimicrobial use is inappropriate, resulting in increased direct pharmacy expenses and resistant pathogens, which can lead to significant impacts on morbidity and mortality. It is recommended that local institution-specific antibiograms with pathogen-specific susceptibility data be updated annually. In many hospital settings, microbiologists or pharmacists create antibiograms. At Magee Rehabilitation Hospital, pharmacy students created the 2014 and 2015 antibiogram, which has led to a more usable antibiogram at our facility for future years.

Methods: Pharmacy students took the largest role in the creation of the 2014 and 2015 antibiogram. Prior to 2014, the antibiogram in use at our facility was developed annually by combining all isolates, regardless of specimen source. Specific to our unique patient population, it was recommended to prepare an antibiogram specific to urine cultures reflecting the prevalence of urinary tract infections (UTI). Therefore, only urine samples were reported for the current antibiogram in order to optimize initial empiric antimicrobial selection. Pharmacy students extracted data from sensitivity results into an excel sheet to sum up the final sensitivities. The 2014 antibiogram required two revisions, one with multiple source isolates and one with single source isolates. With feedback from the Infection Control Committee Infection Control Practitioner and MD Chair, urine cultures with single organism isolates and colony counts greater than 10⁵ colony forming units were identified and five organisms were placed in the final analysis, as per the requirements for Clinical laboratory Standards Institute (CLSI). At least thirty isolates were needed for a particular pathogen to be included in the results for the final analysis.

2016 Summer Meetings Poster Abstracts

Results: Antibiograms were completed by the pharmacy department in 2014 and 2015 using urine cultures for patients within the rehabilitation hospital. A process for the creation of antibiograms using student pharmacist involvement has been established and will lead to the implementation of an antibiotic stewardship program at the institution. Seven different organisms were incorporated into the final 2015 antibiogram. *Enterobacter cloacae* and *Proteus mirabilis* were not included for the 2014 antibiogram due to a sample size of less than 30. In addition, the sample size for each organism was larger in the 2015 antibiogram as compared to the 2014 antibiogram. Only urine samples were reported for the current antibiogram in order to optimize initial empiric antimicrobial selection. The initial 2014 antibiogram was based on single organism isolates; however, it was compared to multiple source isolate, where minimal differences were found for a four-month sample. Student involvement in the antibiogram has allowed for continual updates yearly, which allowed for an increase in utilization by physicians and pharmacist.

Conclusion: Pharmacy student involvement has been valuable in creating a urine sample specific antibiogram within the pharmacy department of a freestanding rehabilitation hospital. The urine culture specific antibiogram provides prescribers a valuable tool in selecting initial empiric antimicrobial therapy until urine culture and sensitivity results are reported. As part of an antibiotic stewardship program, therapy modifications can then be made to streamline antimicrobial therapies to the most appropriate agent, improve patient outcomes and reduce the emergence of resistant organisms.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 24-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Optimizing antimicrobial therapy by integrating rapid pathogen identification and antimicrobial stewardship for patients with enterococcal bloodstream infections

Primary Author:

Yixin Chen, Houston Methodist Hospital

Additional Author(s):

Katherine Perez

Purpose: Enterococcus species is the third leading organism in nosocomial bloodstream infections (BSI) in the United States. Common among severely ill patients, enterococcal BSI leads to high mortality, long-term disability, and loss of quality of life. Delays in pathogen identification force prescribers to initiate empiric broad-spectrum antibiotics in suspected patients. Treatment is further complicated by high rates of antimicrobial resistance among isolates. Compared with traditional microbiology methods, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) quickly identifies common microorganisms. The purpose of this study is to examine the impact of MALDI-TOF MS for rapid organism identification on patients with enterococcal BSI.

Methods: This retrospective, single-center, preintervention/postintervention quasi-experimental study was approved by the institutional review board. Hospitalized adults with enterococcal bacteremia in the preintervention (January 2011 - December 2012, conventional methodologies) and intervention (March 2013 - March 2015, MALDI-TOF MS) study periods were enrolled. Only the first episode of BSI was evaluated. Patients were excluded if: the index BSI was polymicrobial; they were discharged/expired prior to when the index blood culture became positive; patient was under palliative/ hospice care; treatment for any concomitant infection unrelated to the enterococcal bacteremia was deemed ineffective; and/or discharge disposition was determined by circumstances unrelated to BSI. Once MALDI-TOF MS was implemented, infectious diseases trained pharmacists were notified and reviewed identification and susceptibility results in real-time to determine whether treatment was optimal on an individual patient basis. Recommendations were communicated to the primary team as necessary and any changes to therapy were at the physician's discretion. To determine the impact of implementing MALDI-TOF and real-time antimicrobial stewardship on process

2016 Summer Meetings Poster Abstracts

measures and antibiotic optimization, two pharmacists recorded and compared turnaround times for microbiology results between the two study time periods. The primary outcome was the time to organism identification, defined as the time, in hours, from blood culture collection (infection onset) to identification of organism. The secondary outcome included the time to susceptibility results.

Results: One hundred thirty five patients during the intervention period and 70 patient during the preintervention period were enrolled (N=205). Patients in the intervention arm were older when compared to the preintervention cohort (mean age 67.9 years versus 63.2 years, respectively, $P = 0.04$). Between two study arms, 58 percentage patients were male; 51 percentage enterococcal bloodstream infections were considered nosocomial. *Enterococcus faecalis* accounted for 58 percentage (n=118) of all isolates, *E. faecium* 40 percentage (n=83); 36 percentage (n=74) of all isolates were resistant to vancomycin. The mean time-to-positivity (TTP) for the index blood culture was 21.2 ± 12.0 hours overall and was not significantly different between groups ($P = 0.07$). Addition of MALDI-TOF significantly reduced the mean time to microorganism identification from 42.0 ± 5.0 hours in the pre-intervention group to 31.5 ± 12.8 hours in the intervention group ($P < 0.001$), a 25.3 percentage reduction by MALDI-TOF rapid diagnostics. The mean time to antimicrobial susceptibility results was 65.5 ± 19.8 hours and was not significantly different between preintervention and intervention period ($P = 0.12$). Pharmacists documented a total of 69 recommendations, 46 percentage of which were antibiotic de-escalation, 44.9 percentage regimen optimization, and 37.7 percentage culture mismatch.

Conclusion: Matrix-assisted laser desorption ionization time-of-flight mass spectrometry is a rapid and reliable diagnostic tool for the identification of *Enterococcus* species, providing excellent support to institutional antimicrobial stewardship activities.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 25-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Evaluating the use of alternative medications for the use of methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus*

Primary Author:

Brooke Ellard, Samford University McWhorter School of Pharmacy

Additional Author(s):

Jeffrey Kyle

Purpose: Antimicrobial resistance among gram-positive organisms, particularly those caused by methicillin-resistant *Staphylococcus aureus* and vancomycin-resistant *Enterococcus*, has become a major concern. New agents effective against these organisms are available, however, to preserve their effectiveness, minimize their potential toxicities and provide cost-effective therapy, it is essential to ensure these agents are used appropriately. The purpose of this study is to determine the number of patients for which vancomycin alternatives are appropriately prescribed. The results of this study could assist in providing potential pharmacist led interventions that enhance quality of care for patients while also curbing the potential for resistance.

Methods: Permission to begin data collection was granted by the Institutional Human Research Review Board at the study center. A retrospective chart review was conducted from April 1st, 2014 to March 31st, 2015. The retrospective chart review took place at a community medical center and involved reviewing charts of patients who received ceftaroline, daptomycin, or linezolid. Descriptive statistics (e.g. mean, median, mode, and percentage) were used to describe the collected information. Collected data that was included: relevant patient demographics (age, race, BMI), patient allergies, indication, antibiotic therapy received (name, dose, route, and frequency of administration), previous vancomycin use, history of methicillin resistant *Staphylococcus aureus*, history of vancomycin resistant *Enterococcus*, and the vancomycin minimum inhibitory concentration, and culture data. The primary outcome measured was the number of patients appropriately prescribed vancomycin alternatives. Appropriate vancomycin indications were based upon the Vancomycin Therapeutic Guidelines: A Summary of Consensus Recommendations from the Infectious Diseases Society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases

2016 Summer Meetings Poster Abstracts

Pharmacists. Appropriate vancomycin alternative indications were based on specific Food Drug Administration approved indications for daptomycin, ceftaroline, and linezolid, a history of vancomycin-resistant Enterococci, previous vancomycin treatment, or a vancomycin minimum inhibitory concentration of greater than two.

Results: A total number of 85 patient charts were reviewed. Vancomycin alternatives prescribed included: daptomycin (n=46), linezolid (n=34), and ceftaroline (n=5). Based on the primary endpoint, appropriate vancomycin alternatives were discovered to be prescribed: daptomycin (80.4%), linezolid (64.7%), and ceftaroline (100%). Vancomycin allergies were noted in 10 charts. Previous vancomycin therapy were reported in 65.9% of patients, a history of methicillin resistant *Staphylococcus aureus* in 22.3% of patients, and 10.6% of patients had a history of vancomycin resistant Enterococcus. Only 5.9% of the charts indicated a minimum inhibitory concentration of greater than two.

Conclusion: Based on this study, 24.7% of the patients were inappropriately prescribed ceftaroline, daptomycin, or linezolid. Results of the study help to conclude that a more strict protocol should be put into place for prescribing these three medications. Interventions that help to ensure proper use of vancomycin alternative medications will help to prevent resistance and will preserve these agents' role in the antimicrobial armamentarium against bacterial infections.

2016 Summer Meetings Poster Abstracts

Submission Category: Investigational Drugs

Session-Board Number: 26-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Crisaborole Topical Ointment, 2%, a novel, nonsteroidal, topical, anti-inflammatory, phosphodiesterase inhibitor in 2 Phase 3 studies in children and adults with mild-to-moderate atopic dermatitis

Primary Author:

Lee Zane, Anacor Pharmaceuticals

Additional Author(s):

Amy Paller

Wynn Timer

Lawrence Eichenfield

Adelaide Hebert

Purpose: Atopic dermatitis (AD), a complex chronic inflammatory skin disease with distressing signs and symptoms, occurs primarily in children and confers a significant burden upon patients, caregivers, and the health care system. Topical therapies for AD have changed very little over the past 15 years and heavily rely on 2 broadly acting treatment categories (corticosteroids and calcineurin inhibitors) that are limited in length of application and treatment areas and constrain providers to weigh the need for relief versus safety concerns. Herein, we assess the safety and efficacy of the novel, nonsteroidal, topical, anti-inflammatory phosphodiesterase 4 (PDE4) inhibitor, Crisaborole Topical Ointment, 2%.

Methods: Patients 2 years or older with mild-to-moderate AD were enrolled in 2 multicenter, double-blind, vehicle-controlled Phase 3 studies of identical design (301, 302). Patients were randomized 2:1 to receive crisaborole or vehicle twice daily with evaluation on Days 8, 15, 22, and 29. Primary and secondary efficacy endpoints analyzed AD disease severity with the Investigator's Static Global Assessment (ISGA). The primary endpoint defined Success in ISGA as "clear/0" or "almost clear/1" with at least a 2-grade improvement from baseline. Supportive efficacy endpoints examined time to improvement in pruritus, severity of pruritus, and signs of AD. Improvement in all signs and symptoms of AD was defined as "none/0" or "mild/1" with at least a 1-grade improvement from baseline.

2016 Summer Meetings Poster Abstracts

Results: Studies 301 and 302 enrolled 503:256 and 513:250 crisaborole/vehicle patients, respectively. More crisaborole-treated patients achieved ISGA success than those treated with vehicle at Day 29 (301: 32.8% vs 25.4%, $P = 0.038$; 302: 31.4% vs 18.0%, $P < 0.001$), with a greater percentage of “almost clear/1” or “clear/0” ISGA scores (301: 51.7% vs 40.6%, $P = 0.005$; 302: 48.5% vs 29.7%, $P < 0.001$). Success in ISGA and Improvement in Pruritus were achieved earlier with crisaborole-treated patients than vehicle-treated patients ($P < 0.001$ vs vehicle). For all clinical signs of AD, a greater proportion of crisaborole-treated patients achieved success by Day 29 ([crisaborole vs vehicle] erythema: 58.8% vs 40.0%; induration/papulation: 54.8% vs 47.6%; exudation: 39.5% vs 30.3%; excoriation: 60.1% vs 48.0%; lichenification: 51.6% vs 40.9%). Most treatment-related adverse events (AEs) were mild and included application site pain (pooled: 4.4% vs 1.2%) and upper respiratory tract infection (pooled data: 3.0% vs 3.0%). AEs resulted in study discontinuation in 1.2% of crisaborole and vehicle patients.

Conclusion: Two Phase 3 studies show that crisaborole represents a novel, safe, and efficacious treatment for patients as young as 2 years of age with mild-to-moderate AD.

2016 Summer Meetings Poster Abstracts

Submission Category: Leadership/Management

Session-Board Number: 27-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Applying lean principles to improve medication preparation and delivery at an acute care hospital

Primary Author:

Anh Do, Palomar Health

Additional Author(s):

Diana Schultz

Jeremy Lee

Purpose: Healthcare is an ever-changing landscape, with national organizations such as the Joint Commission and Centers for Medicare and Medicaid Services calling for a greater emphasis on performance improvement. Stricter budgets, increased drug costs, and staffing issues push the leadership team to achieve operational efficiency and make it a priority. This project was designed to improve non-Pyxis medication preparation and delivery using Lean principles, which can create more value for customers by eliminating waste (inefficiencies) and providing maximum value with fewer resources.

Methods: An analysis of quality review reports involving incorrect medication administration times showed an opportunity for improvement in the dispensing of non-Pyxis medications. Dispensing to the right area following patient transfers, reducing missing medication requests, and ensuring that turnaround times are appropriate for first-dose medications were the areas of focus in this process improvement project. Value stream mapping and spaghetti diagrams were created to layout the current state of the pharmacy department and identify areas of improvement. To measure turnaround time, time studies were done at baseline and following the implementation of yellow printer labels that distinguished first-dose and requested oral and intravenous medications from routine batch labels. Staff were reminded through emails and daily huddles to treat medications printed on yellow labels as priority. To improve transfers of medications with patients, a Cerner task list reminder for nurses was created and technicians were told to call nurses if requests came through for transfer medications. Root causes for each improvement opportunity were identified using the 5 Whys Lean principle. The Plan-Do-Check-Act (PDCA) Cycle was used to execute and sustain each process change. After piloting these

2016 Summer Meetings Poster Abstracts

changes, an ideal state value stream map was created with guidance from management and staff.

Results: The average turnaround time for first-dose and requested oral and intravenous medications (n equals 26) was 9.9 minutes prior to the implementation of yellow printer labels. The average turnaround time after implementation of yellow printer labels improved to 7.2 minutes (n equals 26). Six technicians and five pharmacists upon questioning felt that the yellow labels were a good visual queue in prioritizing workflow. Five technicians upon questioning also felt that calls and requests for medications for patient transfers decreased one week following the implementation of the Cerner task list reminder for nurses. Staff as a whole felt that Lean principles were successful in decreasing inefficiencies, optimizing workflow and were excited for future improvements.

Conclusion: Applying Lean principles were helpful in identifying waste and inefficiencies to optimize medication preparation and delivery in the inpatient pharmacy. Lean is a powerful method for continuous improvement to increase both quality for customers and staff satisfaction.

2016 Summer Meetings Poster Abstracts

Submission Category: Leadership/Management

Session-Board Number: 28-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Assessing comfort level of part-time supervisory pharmacists in accessing emergent supervising information before and after conversion to an electronic repository

Primary Author:

Ashley Simpson, Virginia Commonwealth University

Additional Author(s):

Scott Anderson

Purpose: At the University of Virginia Health System, the roles and responsibilities of acting supervisor are occasionally placed on pharmacist staff members who do not normally act in this capacity. This can be uncomfortable for pharmacists, as the knowledge required takes significant time and experience to become intuitive. Information required to appropriately resolve conflicts and emergent situations are stored in a paper notebook in the inpatient pharmacy. The purpose of this study is to analyze the difference in comfort for acting supervisor pharmacists while accessing emergent information stored in an electronic repository versus a paper-based notebook.

Methods: This time-and-motion study of part-time pharmacist supervisors (n=6) assessed metrics of comfort and usability while using an emergent information repository ("notebook") through administration of a 9-question assessment and 6-question survey. The assessment and survey were given before and after conversion from the paper-based notebook to an electronic notebook. Differences in individual responses before and after conversion were assessed for each respondent, with the assessment being both timed and graded for accuracy. The 5-point Likert scale survey measured agreement to statements regarding usability of the notebook. The primary outcome was the difference in comfort level of using the acting supervisor notebook to access emergent information through the composite response of questions 1, 2, and 4 on the survey. Secondary outcomes were difference in time to retrieve information and accuracy of responses via the result of the assessment, as well as difference in opinion of usefulness and accessibility of the notebook via results of the survey.

Results: Assessment of our primary outcome of comfort level resulted in overall averages of 10.83 and 13 out of a possible 15 points before and after implementation of the electronic

2016 Summer Meetings Poster Abstracts

repository, respectively, with a positive improvement in score for each respondent. Secondary outcome assessment results showed an average decrease in time to complete the assessment of 2.67 minutes (13.3 minutes before and 10.67 minutes after), with the accuracy of responses increasing from an average of 83.3% before to 100% after. Difference in opinion of usefulness increased from an average of 6.67 to 8.67 out of a possible 10 points, while difference in opinion of accessibility of the notebook increased from an average of 3.67 to 4.5 out of a possible 5 points.

Conclusion: Conversion to an electronic repository from a paper-based notebook increased the comfort level of part-time pharmacist supervisors accessing emergent information. This facilitated decreased time to retrieve information, increased accuracy of responses, and improved opinions on usefulness and accessibility. Limitations of the study included potential for response bias from using the same questions for the pre- and post-implementation assessment, the potential for inaccurate or duplicate entries of conflicting information in the notebook influencing answer accuracy, and the risk of bias due to use of a convenience sample of respondents. An electronic repository may improve comfort and accuracy while addressing emergent issues.

2016 Summer Meetings Poster Abstracts

Submission Category: Oncology / Hematology

Session-Board Number: 29-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Analysis on incidence and risk factors of trastuzumab infusion related reactions after premedication.

Primary Author:

Ji Hee Kim, Kwon o Jung

Additional Author(s):

Seon Young Chung

Byung Koo Lee

Purpose: Trastuzumab is a monoclonal antibody used to treat breast cancer patients with overexpression of human epidermal growth factor receptor-2(HER2). Like many other monoclonal antibodies, trastuzumab is associated with infusion related reactions, such as serious adverse reactions requiring medical intervention and impacting patients' quality of life. For this reason, our institution implemented a trastuzumab premedication protocol administering a chlorpheniramine in initial trastuzumab infusion. The goal of this study is to determine a incidence and clinical features of infusion related reactions under the protocol and to investigate risk factors associated with the protocol.

Methods: This retrospective chart review study has been approved by the institutional review board at Samsung Medical Center. For breast cancer patients who received the first trastuzumab treat between January 1, 2013 and February 28, 2014, the following data have been collected: age, BSA, stage, hormone receptor, performance status, dose of trastuzumab, infusion frequency, infusion time, premedications, and concurrent anti-cancer therapy. Using these data, a statistical analysis is performed with SPSS to study risk factors .

Results: The information of 187 patients who received trastuzumab (2963 infusions) treat were evaluated, and thirty three infusion related reactions were identified in 32 patients(17.1%). Most of reactions were observed in the initial infusion and the major symptoms of infusion related reactions were chilling and shivering (55.6%), and headache (13%). All infusion related reactions were mild or moderate and successfully treated with antihistamines and steroids while stopping the infusion. Based on the univariate regression analysis and the multi-variable logistic regression analysis by varying clinical information of patients, anti-cancer drugs in

2016 Summer Meetings Poster Abstracts

combination with trastuzumab, and premedication drugs, a meaningful statistical variable is not found. After investigating symptoms and strengths of side effects based on Common Terminology Criteria for Adverse Events (CTCAE) Version 4.03 of National Cancer Institute, observed side effects are considered as grade 1 (8 patients, 24.2%) and grade 2 (25 patients, 75.8%) without severe side effect developments.

Conclusion: Compared to infusion related reactions of the manufacturer's report(40%), the incidence of infusion related reactions (implemented trastuzumab premedication protocol) is 17.1%. Moreover, all developments were mild and easily managed. When analyzing risk factors, a statistically meaningful variable was not found. As a result, infusion related reactions are not correlated with the given risk factors. To avoid potential infusion related reactions, checking medical history and allergic reactions of patients is required. In addition, the use of premedications and careful monitoring is required to patients who had infusion related reactions before.

2016 Summer Meetings Poster Abstracts

Submission Category: Pediatrics

Session-Board Number: 30-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Temperature excursion and effect on product stability for ciprofloxacin thermosensitive otic suspension

Primary Author:

Chung Lu, Otonomy, Inc

Additional Author(s):

Anna Stepanenko

Ted Schiess

Purpose: OTO-201 (6% ciprofloxacin otic suspension) was recently FDA-approved for the treatment of pediatric patients with bilateral otitis media with effusion undergoing tympanostomy tube (TT) placement. OTO-201 should be stored at 2-8°C (36-46°F) in the original carton and protected from light until prior to use. The purpose of these studies was to evaluate the stability of the OTO-201 vials at temperatures outside storage conditions via freeze/thaw (Study 1) and cold/elevated temperature (Study 2) cycling.

Methods: Vials of OTO-201 drug product underwent 5 temperature cycles of 24 hours each from freeze (-20°C or -5°C) to thaw (5°C). Following completion of all cycles, prespecified assay testing was performed and results were compared to control vials stored at 5°C. A second similar study was conducted to allow testing of vials stored at elevated temperatures (30°C or 40°C) for 24 hours compared to similar controls (5°C). Testing included appearance, HPLC analysis, quantification of chromatographic impurities, pH, particle size distribution, aldehyde content, temperature of gelation, and osmolality.

Results: In both studies, vial appearance was white to pale yellow and a viscous flowing liquid suspension. HPLC assay results were within 90% to 110% of range when compared to controls. Chromatographic impurities, pH, particle size distribution, temperature of gelation, osmolality, and viscosity were all within established specifications after 5 cycles from either -20°C/5°C or -5°C/5°C (Study 1) or after 5 cycles from either 30°C/5°C or 40°C/5°C (Study 2).

Conclusion: As stated in the prescribing information, OTO-201 should be stored at 2-8°C (36-46°F) in the original carton and protected from light until prior to use. Two separate

2016 Summer Meetings Poster Abstracts

temperature excursion studies showed 24-hour temperature excursions of OTO-201 vials at temperatures from

-20°C up to 40°C are acceptable and did not affect product quality.

2016 Summer Meetings Poster Abstracts

Submission Category: Pharmacy Law/ Regulatory/ Accreditation

Session-Board Number: 31-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Empowering student pharmacists as leaders for pharmacy advocacy

Primary Author:

Laura Nice, Northeast Ohio Medical University

Additional Author(s):

Angela Goodhart

Dale English

Purpose: Advocating for the future of pharmacy practice is critical for expanding pharmacists' scope of practice. Student pharmacists enrolled in accredited doctor of pharmacy programs have an immense opportunity to learn about the importance of advocacy and actively participate in advocacy efforts. This project describes advocacy endeavors of student pharmacists within a Doctor of Pharmacy program. These advocacy efforts engage student pharmacists through the building of foundational knowledge in the legislative process, communicating current pharmacy-centric health care legislation, and promoting student pharmacist interaction with legislators.

Methods: Our doctor of pharmacy program promotes student pharmacist involvement in advocacy in a variety of ways, including offering a third year elective in Pharmacy Legislation and Advocacy. Student pharmacists learn about the legislative process and considerations for different stakeholders' points of view. They also provide education about legislative issues to fellow student pharmacists in preparation for our state pharmacist association's student legislative day. Our curriculum includes two required sessions on advocacy for second year student pharmacists within a Pharmacist Patient Care Experience (PPCE) course. Student pharmacist-led efforts include programming from our Student Society of Health-System Pharmacy (SSHP). Our SSHP has paired with ASHP to host a webinar with ASHP legislative staff members. We have also sent eight student pharmacists to ASHP's Student Advocacy Training and Legislative Day in Washington, DC over the last two years. These student pharmacists have returned to assist in leading student pharmacist advocacy efforts through letter writing sessions, constructing a provider status endorsement wall, and teaching in the PPCE course. Our SSHP also has Legal Affairs Chairpersons regularly update our membership on current legislative efforts. This year, we collaborated with four other SSHP chapters in our state to lead

2016 Summer Meetings Poster Abstracts

a letter writing campaign during the nationwide Practice Advancement Initiative (PAI) week. Our SSHP has also been working to develop a promotional video of providers and patients testifying on the value of pharmacists.

Results: Advocating for the profession of pharmacy has led to major advancements in practice. Discussion will be provided in this presentation on the vital activities and participation that student pharmacists provided to recently passed state pharmacy legislation which includes, but is not limited to, maximum allowable cost (MAC) transparency, pharmacy benefit manager (PBM) reforms, pharmacist-provided immunizations expansion, and collaborative practice expansion. In addition, we will provide a discussion on grassroots support for national pharmacy legislation. Many factors play into change, but student pharmacists taking an active role in advocating at the state and national level contribute significantly. Student pharmacists provide a fresh perspective to legislators, and it is likely that the consistent voice of student pharmacist constituents has played an integral role in these major changes.

Conclusion: Student pharmacists represent the future of the profession so engaging them early in advocacy efforts allows for continued promotion of pharmacy practice advancement. Our doctor of pharmacy program empowers student pharmacists to advocate for their future profession. The curriculum and SSHP student pharmacist-led efforts allow all student pharmacists to graduate with the knowledge and confidence to successfully advocate for pharmacy practice advancement. Our program continues to strive to be a leader in promoting pharmacy advocacy among all student pharmacists as well as practicing pharmacists, welcoming all opportunities to assist other doctor of pharmacy programs in implementation of similar advocacy efforts.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 32-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Hospital costs for common postsurgical pain interventions: results of a national database analysis

Primary Author:

Shelby Corman, Pharmerit International

Additional Author(s):

Simon Dagenais

Shan Jiang

Jennifer Stephens

Tong Gan

Purpose: Common interventions used to manage postsurgical pain include single-injection peripheral nerve block (sPNB), continuous peripheral nerve block (cPNB), continuous epidural analgesia, and continuous wound infiltration (CWI) of local anesthetics. The objective of this study was to estimate the cost of providing these interventions from a hospital perspective.

Methods: Study data were acquired from the Premier database, in which hospital costs are estimated from charges using hospital-specific cost-to-charge ratios. Hospitalizations of adult patients with at least one inpatient procedure occurring between 7/1/2013 and 9/30/2014 were included. Patients were first classified according to the type of post-operative analgesia they received using Current Procedural Terminology (CPT) codes or standard charge code descriptions. Detailed hospital charges were then examined for each intervention to identify related cost components such as local anesthetics (bupivacaine and ropivacaine), opioids (patient-controlled analgesia [PCA] and other), elastomeric pumps, and other equipment/supplies. Within each category, the weighted mean cost per patient was calculated by multiplying the mean cost of each item by the proportion of patients billed for that item. In the continuous epidural group, local anesthetic and epidural opioid costs were reported in aggregate because these medications were frequently mixed in the same bag. Opioid PCA costs included both medication and equipment costs, and were weighted by the proportion of patients receiving opioid PCA in each group. Hospital costs for each intervention were estimated separately for the four most common surgical procedures and combined into a weighted average.

2016 Summer Meetings Poster Abstracts

Results: A total of 3,904,900 admissions with at least one inpatient procedure occurred during the study period. For sPNB and cPNB, the most common surgeries were total knee, shoulder, and hip arthroplasty, and lower extremity open fracture reduction. For continuous epidural, only the two most common surgeries (Caesarean section and open abdominal) were included due to sample size limitations. For CWI, the most common surgeries were total knee arthroplasty, open cardiac, open abdominal, and spinal fusion. The mean total costs of providing the analgesia intervention were \$431 for sPNB, \$666 for cPNB, \$309 for continuous epidural, and \$363 for CWI. The mean cost of local anesthetics was highest in the cPNB group (\$206) followed by CWI (\$63) and sPNB (\$61). For CEA, the mean cost of local anesthetics and opioids was \$83 per patient. In the other groups, weighted mean opioid PCA costs were similar (\$13, \$19, and \$22 for sPNB, cPNB, and CWI, respectively). The remainder of costs consisted of non-PCA opioids (\$69, \$74, \$26, and \$56 for sPNB, cPNB, continuous epidural, and CWI), pumps (\$181, \$132, and \$221 for cPNB, continuous epidural, and CWI), and other equipment/supplies (\$288, \$186, and \$68 for sPNB, cPNB, and continuous epidural).

Conclusion: This study provides a comprehensive estimate of hospital costs related sPNB, cPNB, continuous epidural, and CWI, for different surgical procedures. Among the interventions examined, costs were highest for cPNB, which had higher drug costs compared to sPNB and CWI, and also required an elastomeric pump. These findings may be useful to hospital pharmacists as they evaluate existing and novel interventions to manage postsurgical pain.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 33-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: A pilot study evaluating the effect of pharmacist medication education on the medication communication scores.

Primary Author:

Ahmed El Kority, Cardinal Health

Additional Author(s):

Purpose: Pharmacists can serve as a great resource to help improve patient satisfaction and HCAHPS scores. Our hypothesis is that pharmacists' daily rounds and counseling can greatly improve the hospital's HCAHPS S scores.

Methods: This was a 90- day study with Quasi-experimental design. A clinical pharmacist rounded on daily basis on the 20 beds Med-Tele unit to help improve patient medication education and further enhance patient satisfaction. An average of three patients were seen per day and a total number of 180 patients were encountered during the three months period from May through July 31, 2015. The patient encounter was structured in a simple way that could be easily understood by all types of patients regardless of their level of education. The clinical pharmacist starts the day by analyzing patients' profiles, labs and medication reconciliation records. During this process, different interventions were documented and physicians were contacted for medication regimen adjustments as required. It was determined that interventions will be outside the scope of our study as our major focus is patient satisfaction and HCAHPS scores. All patients admitted to the Med-Tele unit were illegible eligible to be included in our study with the following exceptions: patients with altered mental status, hospice patients, patients who don't do not speak English, and inmates. Patient responses from the HCAHPS survey were analyzed three months before the study and three months during the study to evaluate the change in patient responses with regards to medication communication domain

Results: Thirty seven surveys were collected and analyzed for patients discharged between the period of February 1 through April 30, 2015. Those results were compared to thirty seven surveys that were collected three month after . The percentage of patients who responded as always being communicated about their medications increased by 18% (55.4% for discharges

2016 Summer Meetings Poster Abstracts

from February 1 through April 30, 2015;65% for discharges from May 1 through 31,2015). Statistically this improvement in patient responses wasn't significant ($p= 0.47$, Chi-squared test, 2- sided). The percentage of patients who responded as always being communicated about what their new medications are used for was increased by 18% (67.6% for the discharges from February 1 through April 30, 2015;80.6% for discharges from May 1 through 2015 and July 31,2015). Statistically this improvement in patient responses was not significant ($p= 0.55$, Chi-squared test, 2 -sided). The percentage of patients who responded as always being communicated about medication side effects improved by 16% (43.2 % for discharges from February 1 through April 30, 2015;50% for discharges from May 1 through 2015 and July 31,2015. Statistically the improvement in patient responses about medication side effects communication was not significant ($p= 0.48$, chi-squared test, 2-sided)

Conclusion: A pharmacist can be a major player in improving patient satisfaction and enhancing patient care and safety. This can be done by moving towards a more decentralized pharmacy model where pharmacists spent more time with patients. The decentralized model is very challenging for small and medium size facilities but pharmacy leadership should find innovative ways in balancing budget restraints with market demands and organization goals and objectives. In the coming few years, it will be easier to calculate organizational savings from more pharmacy enrolment in direct patient care as value- based purchasing becomes fully implemented

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 34-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: A real-world evaluation of hospitalization rates among patients with schizophrenia enrolled in a patient information program

Primary Author:

Guillaume Germain, Groupe d'Analyse Ltée

Additional Author(s):

Dominic Pilon

Tony Amos

Patrick Lefebvre

Carmela Benson

Purpose: Among patients with schizophrenia, antipsychotic adherence may reduce the risk of hospitalization and relapse. A patient information program was recently implemented to provide assistance to patients prescribed paliperidone palmitate or risperidone long-acting injectables (LATs) after determined to be clinically appropriate therapy. This program aims to help patients initiate and maintain LAT treatment, including information on alternate injection locations (pharmacies, infusion clinics, and ambulatory care clinics). This study assessed hospitalization rates of program enrollees treated with LATs (program patients) compared to patients from two external cohorts not enrolled (non-program patients) and treated with LATs or oral antipsychotics (standard of care [SOC]).

Methods: Data on adult schizophrenia patients from medical chart reviews enrolled in the program and Medicaid claims of four states (Florida, Kansas, Mississippi, and New Jersey) where the program was not fully implemented were analyzed. Patients initiating an LAT (i.e., paliperidone palmitate or risperidone) and enrolled in the program were compared to non-program patients initiating an LAT and to non-program patients switching SOC therapy; for which the first dispensing between 03/2011 and 03/2013 was termed the index date. Baseline characteristics were assessed for 12 months pre-index. Patients were required to have at least 180 days of follow-up data and not be hospitalized at index date. Hospitalization rates at 6 months post-index for program and non-program patients were evaluated from patient charts and claims, respectively. Each program LAT patient was matched with 3 non-program LAT patients and 4 non-program SOC patients using propensity score matching to adjust for

2016 Summer Meetings Poster Abstracts

observed differences between cohorts. All outcomes were compared between program and non-program LAT patients as well as between program LAT and non-program SOC patients. Observed hospitalization rates were compared between cohorts using Chi square tests. Comparisons were made using odds ratios (ORs), 95% confidence intervals (CIs), and p-values obtained from generalized estimating equations models with binomial distribution and log link function, adjusting for the match design, hospitalization at baseline, and propensity score. No adjustment was made for multiplicity.

Results: A total of 102 program LAT, 1,228 non-program LAT, and 9,617 non-program SOC patients were identified. All program LAT patients (N=102) were compared to 306 matched non-program LAT patients and to 408 matched non-program SOC patients. The proportion of patients with a baseline hospitalization was 19.6%, 24.8% ($p=0.28$), and 17.9% ($p=0.69$) for the program LAT, non-program LAT, and non-program SOC patients, respectively. The observed 6-month post-index hospitalization rate was 14.7% for the program LAT patients, 21.6% for non-program LAT ($p=0.13$), and 22.5% for non-program SOC patients ($p=0.08$). After adjustments, program LAT patients were associated with lower odds of hospitalization compared to the non-program LAT patients (OR [95%CI]: 0.63 [0.35-1.13]; $p=0.12$). Compared to the non-program SOC patients, program LAT patients had significant lower odds of being hospitalized in the 6 months post index date (OR [95% CI]: 0.55 [0.32-0.95]; $p=0.03$).

Conclusion: Patients with schizophrenia treated with a LAT and enrolled in a patient information program were observed to have a numerically lower hospitalization rate and lower odds of hospitalization than external comparison cohorts treated with LAT or SOC. While these findings were based on a short follow-up period (6 months) and small sample sizes (102 patients in program LAT cohort), these results suggest that a patient information program may be associated with a positive clinical impact. Additional research is needed to better understand the program's effect on long-term patient outcomes.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 35-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Persistence to antipsychotics among patients with schizophrenia enrolled in a patient information program

Primary Author:

Guillaume Germain, Groupe d'Analyse, Ltée

Additional Author(s):

Dominic Pilon

Tony Amos

Patrick Lefebvre

Carmela Benson

Purpose: Schizophrenia patients face many challenges with persistence to antipsychotic. In 2010, a patient information program was implemented to provide assistance to patients prescribed paliperidone palmitate or risperidone long-acting injectables (LATs) after determined to be the most clinically appropriate treatment option. This program aims to help patients initiate and maintain LAT treatment, including information on alternate injection locations (pharmacies, infusion clinics, or ambulatory care clinics). This study assessed 6-month persistence to antipsychotics of program enrollees treated with LATs (program patients) versus two external cohorts of patients not enrolled (non-program patients) and treated with LATs, or oral antipsychotics (standard of care [SOC]).

Methods: Data on adult schizophrenia patients from medical chart reviews enrolled in the program and Medicaid claims of four (Florida, Kansas, Mississippi, and New Jersey) states where the program was not fully implemented were analyzed. Patients initiating a LAT (i.e., paliperidone palmitate or risperidone) and enrolled in the program were compared to non-program patients initiating a LAT and to non-program patients switching SOC therapy between 03/2011 and 03/2013 at index date. Baseline characteristics were assessed for 12 months pre-index. Patients were required to have at least 180 days of follow-up data and not be hospitalized at index date. Persistence at 6 months post-index for program enrollees was determined from patient charts. Non-program enrollees without a gap ≥ 60 days between prescription claims or between the last prescription and 6 months post-index were considered persistent. Program patients were matched into two pairwise comparisons: a 1:3 ratio

2016 Summer Meetings Poster Abstracts

(program enrollee treated with LAT: non-program enrollee treated with LAT) and 1:4 ratio (program enrollee treated with LAT: non-program enrollee treated with SOC). Propensity score matching was used to adjust for observed differences in demographics and baseline clinical characteristics between cohorts. Odds ratios (ORs), 95% confidence intervals (CIs), and p-values for persistence were calculated using generalized estimating equations (GEE) models with binomial distribution, log link, adjusting for the match design and the propensity score. No adjustment was made for multiplicity.

Results: A total of 102 program LAT patients were matched to 306 and 408 non-program LAT and SOC patients, respectively. The mean age was 41, 40, and 41 years old for the program LAT, non-program LAT, and non-program SOC patients, respectively. At 6 months, 88.2% of program LAT patients were persistent versus 45.8% of the non-program LAT patients and 43.9% of the non-program SOC patients. After adjustments, the odds of persistence were eight-fold (OR [95%CI]: 8.04 [4.28-15.08]; $p < 0.01$) and ten-fold (OR [95% CI]: 9.70 [5.22-18.04]; $p < 0.01$) higher for the program LAT patients compared to non-program LAT and SOC patients, respectively.

Conclusion: Schizophrenia patients initiated on an LAT and enrolled in the patient information program were observed to have a significantly higher persistence rate six months after treatment initiation than patients not enrolled in the program and receiving either LAT or SOC. Further research is needed to better understand the program's effect on patient outcomes.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 36-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Medical resource utilization in dermatomyositis/polymyositis patients treated with repository corticotropin injection, intravenous immunoglobulin, and/or rituximab

Primary Author:

Tyler Knight, Covance Market Access Services, Inc.

Additional Author(s):

Christopher Bond

Breanna Popelar

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Purpose: Dermatomyositis and polymyositis (DM/PM) are rare, incurable inflammatory diseases that cause progressive muscle weakness, and can be associated with increased medical resource use (MRU) and loss of work productivity. Corticosteroids and corticosteroid-sparing agents are used early in the treatment paradigm to improve muscle function. When corticosteroid treatment is unsuccessful or not tolerable, patients may receive intravenous immunoglobulin (IVIG), rituximab, or repository corticotropin injection (RCI; H.P. Acthar Gel). The purpose of this study was to compare real-world, non-medication MRU between patients treated with RCI and patients treated with IVIG and/or rituximab for DM/PM.

Methods: Claims of DM/PM patients were analyzed from the combination of three commercial health insurance databases in the United States from July 1, 2009 to June 30, 2014. Patients treated with RCI were propensity score matched to patients treated with IVIG, rituximab, and both (IVIG+rituximab) based on demographics, prior clinical characteristics, and prior MRU. Per-patient per-month (PPPM) MRU and costs (hospitalization, length of stay [LOS], emergency room, hospital outpatient department [HOPD], and physician office) were compared across cohorts using Poisson regression and generalized linear modelling, respectively.

Results: 132 RCI, 1,150 IVIG, and 562 rituximab patients had an average age of 52.6, 46.6, and 51.7 years, respectively and roughly two-thirds were female. More than 69% of DM/PM patients were previously treated with corticosteroids. After matching (130 RCI vs. 390 IVIG; 110

2016 Summer Meetings Poster Abstracts

RCI vs. 330 rituximab; 87 RCI vs. 87 IVIG+rituximab), there were no significant differences in demographics or prior clinical characteristics.

RCI patients had fewer PPPM hospitalizations (0.09 vs. 0.17; $P=0.049$), shorter LOS (3.24 days vs. 4.55 days; $P=0.004$), PPPM HOPD visits (0.60 vs. 1.39; $P < 0.001$), and PPPM physician office visits (2.01 vs. 2.33; $P=0.035$) than IVIG. Compared to rituximab, RCI had fewer PPPM HOPD visits (0.56 vs. 0.92; $P < 0.001$). Compared to IVIG+rituximab, RCI had shorter LOS (2.18 days vs. 5.15; $P < 0.001$) and less PPPM HOPD visits (0.53 vs. 1.26; $P < 0.001$). Total non-medication PPPM costs were lower for RCI compared to: IVIG (\$2,126 vs. \$3,964; $P < 0.001$), rituximab (\$2,008 vs. \$2,607; $P=0.018$), and IVIG+rituximab (\$1,234 vs. \$4,858; $P < 0.001$).

Conclusion: Patients treated with RCI had less PPPM non-medication MRU and costs than patients treated with IVIG and/or rituximab, particularly in the hospital setting where significant costs are incurred.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 37-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Feasibility study of using medication reconciliation quality indicators to evaluate the process in hospital admissions

Primary Author:

Mohammed Aljamal, King Salman Military Hospital

Additional Author(s):

Ahmed Aljamal

Purpose: Medication safety is an international issue. Several studies have reported that medication errors occurs up to 68% during prescribing, 20% during transcribing, 11% during dispensing and 38 during dispensing. The impact of these errors on patient safety is devastating. Medication reconciliation (MR) was found effective in preventing errors on admission. A feasibility study is defined as a small scale research study which aims to assess the practicality of a set of measures or indicators. The purpose of this study was to assess the feasibility of a set of indicators to evaluate the quality of the MR process.

Methods: This is a cross-sectional observational study. Data were collected from two hospital using MR form designed for the purpose of collecting data in this study. The collected data included patient and admission details, the reason for not performing MR, checks about drug allergy (DA), drug history (DH) including sources used, checks of medication adherence and intolerance and identification and documentation discrepancies. A structured non-participant observation design was used to observe 10 pharmacists conducting the MR process in two teaching hospitals. The data were collected by pharmacists conducting MR on admission in the two hospitals. The data were collected and then analysed to assess the feasibility of using 41 indicators to collect routine data related to MR on admission by pharmacists.

Results: Both hospitals used different MR documentation systems that partially documented the MR process. Several aspects of the MR process were conducted but not documented in patient records, such as checking OTC and complementary (herbal) medicines, adherence, intolerance, and identifying discrepancies. Out of the 41 tested indicators, five were considered not feasible due to practical issues. Three were found feasible for the structure of the MR process. Fifteen were thought to be feasible for providing data about the process. Eighteen

2016 Summer Meetings Poster Abstracts

additional indicators were considered feasible for providing detailed information about the process.

Conclusion: Three groups of MR indicators were found feasible for assessing MR, structure, general assessment and additional detailed information about the process. A comprehensive MR documentation system should be used. The MR indicators and the data collection form could be used as a guide in designing such a system and could facilitate the communication between hospital staff and help doctors and nurses to participate effectively in the MR process.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 38-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Medication administration errors at a major hospital in Saudi Arabia

Primary Author:

Mohammed Aljamal, King Salman Military Hospital

Additional Author(s):

Ahmed Aljamal

Purpose: The potential for administration errors during hospital admissions makes the medication administration errors (MAEs) a problem of concern for nursing and patients worldwide. Such errors can affect the treatment outcomes and therefore affect patient safety. This could be used as one of the indicators of evaluating quality of care. A cross-sectional study found that 34 % of the preventable adverse drug events occurred during administration of medication. The objective of this study was to assess the frequency, type, and potential clinical consequences of MAEs in a major hospital in Saudi Arabia.

Methods: The study was a cross-sectional prospective observational study that was conducted in a 32-bed adult medical ward at a tertiary hospital for one month period. The observation was performed during all week days involving morning, evening and night drug administration times. All regularly scheduled oral, inhaled, ophthalmic, injection, topical and rectal doses were included. MAEs was calculated by dividing actual errors by the total number of opportunities for errors. An opportunity for error is defined as any drug prescribed, any unordered or omitted drug, and any dose given and any dose omitted. Disguised method was used. The nurses were accompanied while administering the medication then administered drugs were registered and subsequently compared with eligible prescriptions in the medication chart. There was no conflict of interest.

Results: Frequency, type and category of MAEs.

Results: A total of 169 MAEs was observed out of 2112 opportunities for error, representing an error rate of eight per cent. Five types of errors were detected including dose omission (35%), wrong dose (5%), wrong drug (2%), wrong technique (1%) and wrong time (57%). There was no statistically significant difference in MAEs between weekends and week days ($p= 0.612$) or

2016 Summer Meetings Poster Abstracts

between day and evening doses ($p = 0.832$). Majority of errors did not cause harm (163 errors, 96.44%) and six errors (3.55 %) were prevented before reaching patients.

The common type of MAEs in this study was for wrong time of administration (57.4%), followed by omission of administration (34.9%).

Conclusion: The reported MAE rate of 8% was slightly higher than those reported in other MAE studies. Medical practice could be safer to patients if appropriate technologies that facilitate human work are used. Therefore, electronic unit dose medication management system was implemented by introducing Pyxis MedStation® System at all wards' nursing stations in this hospital. The impact of this technology on MAEs needs to be further investigated.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 41-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Impact of participation in quality monitoring committee on reducing dispensing error

Primary Author:

Cai tong Chen, Far eastern memorial hospital

Additional Author(s):

Tzu-Hui Yeh

Tina Yun-Ting Pan

Tsai-Ting Su

Purpose: Errors that occur during dispensing impact on patient safety. At our medical center, a dispensing quality committee monitors dispensing practice and implements strategies to prevent such errors. It was found that many of these errors are caused by pharmacists that are new to the medical center and are unfamiliar with the formulary. As a result, a new strategy was introduced: new pharmacists had to participate in monthly committee meetings for at least three times within 6 months of entering the medical center. Aim of this study is to determine whether the implementation of this new strategy would minimize dispensing errors.

Methods: All pharmacists new to our medical center from May 2011 to December 2014 were included in this study (n=30). Those pharmacists who had left our medical center before March 2016 were excluded. Control group were 15 pharmacists that had not participated in the committee within 6 months of entering the medical center and experimental group were 15 pharmacists that had participated in at least three committee meetings within 6 months of entering the medical center. Calculation (C1-6) is the number of dispensing errors made per dispensing hour over a six month period. And we follow the value (C7-8) on the seventh to the eighth month again to see whether there was a reduction in dispensing errors when the experimental group had already participated in the meeting three times. Primary outcome measured is the reduction of dispensing error which is calculated by $(C1-6 - C7-8)/(C1-6) \times 100\%$. After participation in the mandatory meetings, the participants were also asked to complete a 10-item questionnaire to assess the impact and benefits of attending the committee meetings.

2016 Summer Meetings Poster Abstracts

Results: In the control group, C1-6 was 0.28 ± 0.17 and C7-8 was 0.19 ± 0.23 . Reduction of dispensing error in the control group was 31.7%. In the experimental group, C1-6 was 0.34 ± 0.23 and C7-8 was 0.21 ± 0.23 . Reduction of dispensing error in the experimental group was 37.9%. Feedback from new pharmacists showed 86.6% thought the compulsory participation was helpful to reduce dispensing errors when they were new to the medical center. 73.3% would recommend other new pharmacists to participate in the meetings. However some of the feedback was negative: only 13.3% would continue to attend the meetings if participation is no longer mandatory, 46.6% found the timing of the meetings inconvenient and 33.3% found the meetings too time-consuming. 40% said the medication labels are only printed in black and white which is difficult to read. The top three strategies that participants thought to be most useful to prevent dispensing errors were highlighting the appearance of the medication on the label, having the formulation of the medication written in Chinese, and if the medication has several strengths, having the strength on the medication label shown in a larger font.

Conclusion: Mandatory participation in the functional group is an effective strategy to reduce dispensing errors caused by new pharmacists. However, the results from this study showed that impact varies according to each individual pharmacist. To increase participation from new pharmacists, we need to consider the frequency and duration of the meeting. With input from new pharmacists, flaws in dispensing process can be identified and adequate strategies can be implemented to enhance patient safety.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 42-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Measuring the impact of an Integrated Care Pharmacist on 30 day readmissions in a community hospital

Primary Author:

Meagan Coughlin, Emerson Hospital

Additional Author(s):

Robert Moura

Purpose: Suboptimal quality of care during care transitions leads to increased hospital readmissions and costs that could be avoided. It is well reported that there is great value in having a Pharmacist involved with transitions of care and to collaborate with the patient care team. Patients with medication discrepancies have higher 30-day readmission rates than patients without. Pharmacists help improve patient outcomes, prevent readmissions and lower costs through medication reconciliation, medication therapy management, discharge counseling and follow up after discharge. Given this, the Pharmacy Department proposed a position for an Integrated Care Pharmacist that was funded through a State project grant.

Methods: The Integrated Care Pharmacist documents all patient encounters after meeting with complex medical patients who have been identified as high-risk for readmission. Patients are either admitted with a certain high-risk diagnosis and/or have a history of multiple admissions to meet criteria. The Pharmacist completes medication reconciliation on admission, ideally when the patient is in the Emergency Room. The Pharmacist then reconciles the home medication list to inpatient orders and clarifies discrepancies with providers. The Pharmacist attends multidisciplinary rounds on one of the medical/surgical floors where high-risk patients may be admitted to and makes recommendations about medication therapies. Medication teachings are also performed, as able, prior to discharge when a high-risk patient is started on a new medicine(s) or multiple changes have been made to medications. Discharge medications are reconciled and the Pharmacist resolves any barriers for a safe discharge regarding medications. Lastly, the Pharmacist makes follow up telephone calls to patients after discharge to ensure appropriate medication use and compliance. The Pharmacist then communicates with outpatient providers and caregivers as appropriate. All of the Pharmacist's activities are

2016 Summer Meetings Poster Abstracts

documented in the electronic medical record and include the amount of time spent at each step.

Results: Observations were made to assess the impact that the Integrated Care Pharmacist had on the readmission rate over a four month period (November to February 2016). The readmission rates for patients seen by the Integrated Care Pharmacist was compared to those patients who did not see the Pharmacist. High-risk patients who were seen by the Pharmacist for admission or discharge medication reconciliation, medication teaching or telephone follow-up had a lower readmission rate of 10.9% versus 22.8% for those who were not. We also observed patient satisfaction increase as there was an opportunity for the Pharmacist to review their medications and discuss with them in detail. Members of the medical team also reported greater professional satisfaction after this collaborative approach to patient care led to improved patient outcomes.

Conclusion: The role of the Integrated Care Pharmacist has proven to be very beneficial as patients, providers and the Pharmacist work as a team to prevent medication related issues from leading to negative outcomes. This Pharmacist has impacted medication safety, patient education and adherence as well as improved communication among providers. The results are significant: safer care transitions, decreased readmissions and decreased costs.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 43-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Root cause analysis (RCA) or not?: application of a standardized method for assessing adverse drug events

Primary Author:

Victoria Do, Saint Vincent Hospital/MCPHS University

Additional Author(s):

Hao Nguyen

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Purpose: The National Patient Safety Foundation (NPSF) published the RCA2: Improving Root Cause Analyses and Actions to Prevent Harm document as guidance to performing root cause analyses. In the RCA2 document, a modified version of the VA National Center for Patient Safety's Safety Assessment Code Matrix was incorporated to assess medication-related events to determine the need for root cause analyses. The purpose of this project was to evaluate the utility and effectiveness of using the matrix tool to determine whether a medication-related event warranted a root cause analysis (RCA) and if it provides consistent outcomes among many users.

Methods: There were 69 medication related events retrieved from our institution's internal electronic error reporting system and screened by two clinical pharmacists and two medication safety fellows utilizing the modified version of the VA National Center for Patient Safety's Safety Assessment Code Matrix. These 69 medication related events occurred from October 2015 to January 2016. Each reviewer was assigned to one month and then randomly selected two medication-related events from another month to double-check the safety assessment code assigned by the initial reviewer.

Results: Sixty-nine medication related events were evaluated, and 11 events (15.94%) warranted a root cause analysis (RCA). These 11 events were all identified as near misses and categorized as National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Category B. Despite the difference in severity and probability categories among evaluators, the final safety assessment code (SAC) ultimately resulted in the same score.

2016 Summer Meetings Poster Abstracts

Conclusion: The modified version of the VA National Center for Patient Safety's Safety Assessment Code Matrix determined that all near miss events warranted a root cause analysis, while errors with high NCC MERP categories did not. Differences in severity and probability categories among evaluators were due to variations in clinical judgment and practical experiences. In the future, a team will be formed to utilize this tool in an effort to control for any discrepancies that could result from variations in clinical experience.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 44-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation of a pharmacist-driven transitions of care program for skilled nursing facility patients within the continuum of care: A pilot program

Primary Author:

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Additional Author(s):

Sara Eltaki

Margaretta Kearson

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Madeline Camejo

Purpose: Among Medicare beneficiaries, the rate for all-cause 30-day hospital readmissions from a skilled nursing facility (SNF) averaged 23.5% nationally (2006) and 22.4% statewide in Florida (fiscal year (FY) 2014). Comparatively, the all-cause 30-day readmission rate from a SNF for a Florida based large acute care facility averaged 26.4% (FY 2014). Research shows that half of patients discharged from hospitals have medication discrepancies leading to discontinuity of care, adverse drug events, hospital readmissions and increased costs. The implementation of a Transitions of Care (ToC) pilot program was established to reduce hospital readmissions and streamline continuity of care.

Methods: A team comprised of pharmacy management, case management and the ToC PGY-2 pharmacy resident met to identify barriers and trends to assist with the development of the SNF ToC program. A retrospective chart review was conducted to determine the readmission rate for the acute care facility to the participating SNF. Subsequent to identifying the barriers, IT developed a consult within the electronic health record (EHR) for case management to alert the ToC pharmacists when a patient is to be discharged to the participating SNF. The ToC pharmacist interventions include admission medication reconciliation, transfer medication reconciliation, inpatient rounding, inpatient education, discharge medication reconciliation, and an on-site visit at the SNF. A ToC pharmacist will visit the SNF within 3-7 days for a one-time visit post discharge to review the medication administration records (MAR) to ensure seamless communication and meet with the patient to address any concerns. All interventions are

2016 Summer Meetings Poster Abstracts

documented in the acute care facilities EHR and descriptive statistics will be used to analyze the data.

Results: After completing a retrospective chart review from November 2, 2014-October 31, 2015 focused on patients discharged from the large acute care facility to the participating SNF determined a 23.3% readmission rate. The time-frame of the ToC SNF pilot is from November 2, 2015-February 10, 2016, which 18 patients have completed, resulting in 21.2% readmission rate. The median pharmacist interventions (admission medication reconciliation, transfer medication reconciliation, inpatient rounding, inpatient education, and discharge medication reconciliation) for the readmitted group was 1.5 compared to 3 for the patients not readmitted.

Conclusion: An interdisciplinary approach is necessary to develop and implement a ToC program. The pilot program's ToC pharmacist interventions show a trend in decreased hospital readmissions. With the integration of a full-time ToC pharmacist there is an expectation for readmissions to further decrease.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 45-M

Monday, June 13, 12:15 p.m. - 1:30 p.m.

Poster Title: Interdisciplinary rounds association with core measure adherence in stroke patients

Primary Author:

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Additional Author(s):

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Jan Jahnel

Purpose: Clinical pharmacists, in concert with an interdisciplinary team, have a proven record to improve patient outcomes in a variety of clinical settings. The majority of the literature is in the critical care, cardiology, ambulatory care, and infectious disease settings. In the neurology setting, use of order sets is an existing method to increase core measure compliance and promote clinical outcomes. Core measure adherence is dependent upon orders synchronizing with best practices and proper documentation. This study aims to track the association of interdisciplinary team rounds with core measure adherence and thirty-day readmission rates, specifically in the stroke population.

Methods: This is a single site, retrospective, cohort study completed over a two-year time frame; October 1, 2013 – November 1, 2015. Patients admitted between October 1, 2013 and October 31, 2014 were admitted prior to the implementation of daily interdisciplinary rounds. Patients admitted between December 1, 2014 and November 1, 2015 were admitted after the implementation of daily interdisciplinary rounds. Patients admitted during November of 2014 were excluded as this was the first month of interdisciplinary rounds. This included 1564 patients over a two year period. Only patients aged 18 years or older were included for study. The primary outcome was composite core measure adherence rate according to Joint Commission standards for certified primary stroke centers. Secondary outcomes include 30 day readmission rates and individual rates of adherence to core measures related to medications, such as percentage of patients discharged on a statin, and percentage of atrial fibrillation/flutter patients on anticoagulation. This study was approved by the Investigational Review Board as exempt research by University of Illinois College of Medicine at Peoria.

2016 Summer Meetings Poster Abstracts

Results: The primary outcome of composite core measure adherence decreased from 89.76% to 87.96% with the implementation of interdisciplinary rounds. The greatest improvement was seen in the secondary outcome of percentage of atrial fibrillation/flutter patients on anticoagulation for stroke prophylaxis, which improved from 86.5% to 97.2%. Other secondary outcomes did not see the same drastic improvement. The percent of patients with an antithrombotic after day two of hospitalization was relatively stagnant at 94.5% to 94.8%. The percent of patients discharged on statins was again relatively stagnant from 95.5% to 95.9%. The overall ischemic stroke 30-day readmission rate fell from 9.04% to 8.02%.

Conclusion: Although the primary outcome of composite core measure adherence decreased, the medication related core measures and 30-day readmission rate improved. Patient care after stroke is often multi-factorial, but can be improved by daily interdisciplinary rounds. Limitations include a lack of adjustment for patient acuity, patient census, provider variability, and verification of accuracy in nursing/physician documentation. It is suspected the primary outcome decreased as a function of non-medication core measures from some of the above limitations. This study has external validity for other settings where core measures or high readmission rates exist for potentially implementing an interdisciplinary rounding service.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 1-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Applying LEAN concepts to the medication return to stock process in the outpatient setting at a Veterans Affairs medical center

Primary Author:

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Additional Author(s):

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Purpose: LEAN principles have been widely recognized to improve the efficiency, cost, and quality of a process by eliminating waste. Reducing pharmacy inventory waste is an important component in the pharmacy department's budget management. Pharmacy technicians identified inventory discrepancy as a problem and suggested that the varying medication return to stock (RTS) processes could be the contributing factor, which also resulted in medication waste. This project was designed to assess probable cost of wasted medications resulting from the RTS process and to develop a standardized process for the pharmacy technicians to incorporate into their daily duties.

Methods: A pharmacy resident specializing in pharmacy administration observed the existing RTS process and noted the accumulation of RTS medications over three days. A team was created consisting of outpatient pharmacy supervisors, formulary pharmacist, informatics pharmacist, front-line pharmacy technicians, and pharmacy technician supervisor. With input from the team, a preliminary RTS process was created that was modified during the study period. During the month of February and early March 2016, the resident assumed the RTS responsibilities previously completed by the pharmacy technicians. This pharmacist collected the names, strengths, and quantities of medications being placed in the medications to RTS bin. In efforts to develop a streamlined process, the pharmacy resident also collected the time to RTS within the medication processing system (VistA) and the medication dispensing automation system (ScriptPro), in addition to the time to return the medications to the shelves. This process improvement was not subject to IRB oversight or R&D Committee approval.

2016 Summer Meetings Poster Abstracts

Results: Twenty-seven days of data were collected for this study. A total of 349 prescriptions were returned to stock during this time period, averaging approximately 13 prescriptions per day. Assuming all RTS medications from the data collection period would have been wasted with the previous RTS process, the total loss would have amounted to \$8,920.86, approximately \$330 per day. Incorrect assumptions about the RTS feature in ScriptPro and the variable RTS processes were the root causes of the waste. By reordering the steps taken to RTS a medication, lot numbers and expiration dates could be retrieved from ScriptPro so that drugs could be returned to the shelves. With this new understanding of the RTS feature, a consistent RTS procedure was developed about half way through the project. Time to complete the new process was only analyzed from this date forward. Data for 16 days and 221 RTS medications were recorded. On average, it took 8.8 minutes to RTS in ScriptPro, 2 minutes to RTS on VistaA, and 4.9 minutes to return the medications to the shelves each day, which is approximately 16 minutes per day.

Conclusion: Previously, RTS'd medications were placed back on the shelves by any technician that had a spare moment. Medications were wasted when returned vials did not have proper lot number and expiration dates. This not only impacted the pharmacy budget, but also the electronic inventory. This project helped to quantify the potential impact on the budget, develop a streamlined RTS process for the pharmacy technicians to incorporate into their daily schedule, reduce medication waste, and ensure a more accurate inventory. Furthermore, designating the RTS responsibility to be completed daily by the inventory technician would eliminate process variability without significantly impacting workload.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 2-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Assessing gender differences in pharmacy leadership training and experiences

Primary Author:

Meighan LeGrand, University of Michigan College of Pharmacy

Additional Author(s):

Kimberly Redic

Lindsey Kelley

Purpose: The purpose of this study was to evaluate the experiences and training of University of Michigan College of Pharmacy (UMCOP) Alumni who are/were in formal leadership roles, and compare results by gender. Of those respondents who are/were in formal leadership positions (FLP), specific leadership-related training and experiences were assessed to determine which were deemed valuable to retaining and succeeding in a FLP. The findings of the study can be applied in practice to help identify organizational barriers limiting the advancement of pharmacists.

Methods: The study was a prospective survey-based project of all University of Michigan College of Pharmacy (UMCOP) Alumni contained in the Alumni Affairs database who were subscribers to the Alumni Newsletter, eInteractions. The estimated size of the database was approximately 4,000 alumni, which included all the living alumni registered with the UMCOP who additionally provided an email address. The study was advertised in the Spring and Summer 2015 issues of eInteractions using a brief article that described the project and included an anonymous link. The same content was published on the UMCOP website on the Alumni News page.

The survey was designed, administered, and analyzed using the Qualtrics Research Suite. After the survey was constructed, 8 current University of Michigan College of Pharmacy faculty that were non-alumni of the college were administered the survey and asked about the clarity, focus, and interpretation of the questions.

Of those who indicated that they currently hold or have held a formal leadership position (FLP), an inventory of formal training and experiences as well as the respondent's perception of value were obtained. Those who indicated that they do not hold or have never held a FLP were

2016 Summer Meetings Poster Abstracts

queried regarding perceived barriers and/or reasons for not obtaining a FLP. Results were compared by gender.

Results: The survey was sent to an estimated 4,000 UMCOP Alumni and the response rate was approximately 3.5% (143 total responses; 130 completed responses). The majority of respondents were women (62%), Caucasian (90%), and married (74%) with dependents (57%). The average age of the respondents was 50.5 years. Of all respondents, 63% have held a leadership position and the majority of positions included manager (26%), supervisor (18%), and pharmacy director (15%).

Of those who have held FLP, a significantly higher percentage of female leaders completed a post-graduate year one program (PGY1) and believed it helped acquire a leadership position and contribute to their success (20.5% vs. 42.5%; $p=0.039$).

The study also focused on factors that influenced the trajectory of one's leadership path. Regarding gender, male leaders considered gender a facilitator (26.4% vs. 4.3%; $p=0.004$) when obtaining a leadership position while female leaders considered gender a barrier (25.5% vs. 5.8%; $p=0.021$).

Additionally, female leaders considered their family a barrier compared to male leaders (29.8% vs. 5.8%; $p=0.007$). And while it did not reach significance, a higher percentage of male leaders (23.5% vs. 12.7%; $p=0.207$) considered their family a facilitator.

Conclusion: Women have been attending and graduating from colleges and schools of pharmacy at a faster rate compared to their male counterparts for over 20 years. However, a small percentage of women hold leadership positions. Factors including mentors, advocates, and the completion of pharmacy residencies have contributed to the success of UMCOP Alumni in leadership positions, and other variables such as gender and family can be seen as barriers to obtaining leadership positions. This study can serve as a basis to help identify organizational barriers that may be limiting the advancement of female pharmacists.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 3-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Algorithm for assessing and approving high cost drug therapy in a large medical center

Primary Author:

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Additional Author(s):

Vern Johnson

Ken Harbaugh

Tim Miller

Kaila Dunnuck

Purpose: Expensive new drugs, some of which provide marginal improvement and/or are indicated for limited patient populations are increasing. Until a national policy addressing allocation of resources, healthcare providers and hospitals must develop mechanisms to assure maximum clinical outcomes at the lowest cost in order to continue to be financially viable for future services.. The purpose of this report is to describe a hospital's assessment process to assure the interests of patients, physicians, and hospital finance are addressed when expensive drug therapies are being considered.

Methods: At this large, tertiary care medical center, medications are evaluated for safety, efficacy, cost and drug properties by the Pharmacy and Therapeutics Committee (P&T). More recently, requests for one-time, expensive, non-formulary medications, have increased. The established, expedited review process by the P&T Chairman was determined to be inadequate. Managers representing hospital administration, finance, oncology and acute care providers, ethics, ambulatory, and pharmacy, developed an algorithm to be initiated for requests of 'expensive', non-formulary drug therapies. The acquisition drug cost trigger designated for review was either \$5,000/dose or \$10,000 per cycle. Prior to therapy, providers were required to complete a 'Financial and Clinical Review Form', describing the patient's demographics, advanced care planning directives, insurance information, disease history, and prognosis. Planned doses and therapy risks and goals must also be provided. Pharmacy Leadership (PL) requests Hospital Finance (HF) to provide insurance verification, hospital network status, level of drug and hospitalization coverage, prior-authorization requirements, financial burden to

2016 Summer Meetings Poster Abstracts

patient and hospital, and availability of other patient assistance programs. A Decision Team (DT), consisting of members from the multidisciplinary management team including the specific patient's provider, conduct a meeting if PL and HF determine there is significant financial burden to the patient and/or hospital. Then the provider and the patient decide the best clinical option.

This quality improvement initiative was determined to be exempt by the institutional review board.

Results: From August to November 2015, there were seven non-formulary drug therapies that met the cost criteria for evaluation, with two being for the same medication. The medications and indications were dinutuximab for high risk neuroblastoma, eculizumab for atypical hemolytic uremic syndrome, blinatumomab for refractory acute lymphocytic leukemia, pembrolizumab for metastatic melanoma, pemetrexed for unresectable malignant pleural mesothelioma and lumacaftor/ivacaftor for cystic fibrosis, homozygous for the F508del mutation. At the time of these drug requests, there was no insurance coverage for 6 patients and unknown coverage in one patient. The results after utilizing the algorithm were three patients receiving drug therapy outside of the hospital, one patient was able to obtain insurance coverage after an appeal was filed, one patient obtained patient assistance, one patient was approved for drug therapy despite lack of coverage, and one patient transferred to hospice and did not pursue treatment. Cost avoidance was approximately \$76,662 for 5 of the seven patients.

Conclusion: An algorithm, developed by a multidisciplinary management team at a large medical center, was used to assess and approve expensive drug therapy. Using an algorithm for collecting and analyzing patient-related data resulted in better informed administrators, providers and patients, and avoided significant financial burden to patients and the hospital. Until a broader, national plan to address expensive pharmaceutical products is implemented, hospitals will need to consider options such as the algorithm described here, in order to reduce significant financial burden that may impede the viability of other clinical services.

2016 Summer Meetings Poster Abstracts

Submission Category: Administrative practice/ Financial Management/ Human Resources

Session-Board Number: 4-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Matching soft skills between employers and job candidates-- a formula for success

Primary Author:

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Additional Author(s):

Purpose: Although a good education is essential when hiring a pharmacy technician, it is not the only component. Soft skills are necessary traits, personal qualities, and habits sought by the employer. To get hired, it is vital to determine which soft skills the employer desires most.

Methods: Thirty-six pharmacy technician students completed a survey about the importance of soft skills. The students were asked to list three soft skills, in order of importance that they felt employers want when hiring pharmacy technicians. The results were compared to a journal article from a major publication, which listed those soft skills that the employer described as essential when hiring an entry-level pharmacy technician. Data from both the survey and the journal article were compared.

Results: Of the seven major soft skills sought by employers when hiring entry-level pharmacy technicians, only three matched the soft skills selected by the pharmacy tech students. From an employer's view point, communication (55%), reliability (35%), and professionalism (31%) ranked first, fourth, and fifth respectively as most desirable. Pharmacy tech students had a different perspective, ranking communication (26%), reliability (21%), and professionalism (33%) as third, fourth, and second respectively. The other four soft skills selected by the pharmacy tech students did not match the employers remaining soft skills.

Conclusion: Simply having soft skills will not result in a candidate getting hired. By determine the exact soft skills that the employer is seeking, one can match an employer's needs, and become closer to securing the job.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 5-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation of clinical pharmacy services within a heart failure clinic

Primary Author:

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Additional Author(s):

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Carol Heunisch

Laura Nasca

Purpose: Disease state education and medication management are vital aspects of caring for patients with heart failure. Historically, heart failure patients at a community health system have been managed by a cardiologist and advanced practice nurse in an outpatient setting. Inclusion of pharmacists on clinical teams can help alleviate medication-related issues while optimizing medication therapies. In efforts to enhance patient care, a pharmacist-managed heart failure clinic was developed.

Methods: With the support of a heart failure specialist, a team consisting of clinical pharmacists and a pharmacy resident was assembled to develop a pharmacist-managed heart failure clinic. Literature review and background research were conducted to gain insight into current practices at other institutions. In order to support the clinic's development, a business plan, training program, electronic health record department, and fee schedule were created. Based on the clinic's anticipated workflow, it was decided to use a hospital-based, medication management model utilizing facility fee billing. A variety of documents were created to support the clinic's development. These included a prescribing and ordering protocol, note template, and medication titration protocol. It was determined that disease state and medication education would be provided to all patients referred to the clinic, while medication titrations would be limited to heart failure patients with a reduced left ventricular ejection fraction. Four hours per week have been dedicated to seeing patients in clinic, and visits have ranged from 30 to 60 minutes in duration.

Results: The pharmacist-managed heart failure clinic was implemented in February 2016. Two pharmacists were trained to conduct the clinic visits. Fourteen patients have been seen in the

2016 Summer Meetings Poster Abstracts

clinic to date. Services provided at these visits have included medication reconciliation, disease state and medication education, medication titration, lab ordering and monitoring, and medication refill facilitation. All patient encounters have been documented in the electronic health record and have been forwarded to the referring cardiologist for review.

Conclusion: A pharmacist-managed heart failure clinic was developed and implemented at a community health system. This clinic has helped to expand the role of clinical pharmacists in the ambulatory care setting and may serve as a model for the implementation of other pharmacist-managed services.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 6-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation and evaluation of ambulatory clinical pharmacy services in the management of hepatitis C infection

Primary Author:

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Additional Author(s):

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Purpose: Treatment of the hepatitis C virus (HCV) has changed dramatically with the approval of direct antiviral agents (DAAs). Ensuring adherence and managing drug-drug interactions are challenges with the use of these novel agents. Providers in the Gastroenterology/Liver (GI/Liver) Clinic at Hennepin County Medical Center (HCMC) have championed ambulatory clinical pharmacy services and have referred all patients for comprehensive medication management (CMM) while they are being treated for HCV. The purpose of this study is to describe service implementation, report medication related problems (MRPs) identified, and evaluate patient satisfaction during the pilot phase of this novel service.

Methods: First, an assessment was conducted to determine the number of patients referred to the pharmacist, and to track the amount of patients eligible for, undergoing, or who have completed HCV treatment within the health system. This data was also used to determine future staffing needs and to evaluate potential revenue capture from patient utilization of the health-system specialty pharmacy. Ambulatory clinical pharmacy services with full CMM visits were implemented in the GI/Liver clinic and visits were recorded in the electronic health record (EHR). Six months of visit data was retrospectively collected from August 2015 – February 2016 and included age, gender, HCV genotype, HCV PCR, DAA regimen, community pharmacy utilized, CMM encounter level of service (LOS), MRPs, and time of each CMM encounter. The pharmacist identified MRPs and stratified to type of MRP (Indication, Efficacy, Safety, and Adherence), medication involved, and type of problem. Patient satisfaction surveys were collected for patients seen from 8/27/15-9/24/15, and again from 11/19/15-12/17/15, using a

2016 Summer Meetings Poster Abstracts

thirteen question survey that has validated by a consortium of ambulatory care pharmacy managers from Minnesota.

Results: During the six month pilot period, 94 CMM visits were completed in the GI/Liver clinic. This included 84 new patient visits and 10 follow up visits. A total of 246 MRPs were identified. The average visit length was 39.4 minutes, and the pharmacist identified an average of 2.6 MRPs per visit. Seventy-eight MRPs were related to appropriate indication, 27 to medication efficacy, 30 to safety, and 109 to medication adherence. Forty-one MRPs were identified to be safety and/or efficacy related drug-drug interactions which may have resulted in treatment failure and/or patient harm. Ninety-two MRPs were related to medication adherence involving directions not being understood by patients.

Forty-five surveys were mailed with fourteen completed (31%). 86% of respondents rated the quality of care and services from the clinical pharmacist as “Excellent”, 7% responded as “Very Good”, and an additional 7 % responded as “Good”. Ninety-three percent of respondents either strongly agreed or agreed that the pharmacist helped them to understand why they take each medication and felt more confident with their medication management.

Conclusion: Data collected reveals that CMM services provided in this clinic may lead to safer and more effective outcomes for patients. Overall, patients are satisfied with their visit with the pharmacist and feel more comfortable with their treatment regimen. Outcomes from this pilot and the initial assessment will be utilized within a business plan in order to promote, expand, and sustain a position within the clinic.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 7-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Analysis of glycemic control and completion of diabetes-related gaps in care in patients enrolled in the diabetes management program compared to standard diabetes care

Primary Author:

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Additional Author(s):

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Sarah Thompson

Purpose: The Diabetes Management Program (DMP) is comprised of clinical pharmacists, a nurse, and a medical assistant. The DMP team complements the care of providers by working with patients telephonically in between office visits to help improve outcomes, quality of care, and continuity of care for high risk patients with diabetes. The purpose of this study was to determine whether the collaborative efforts of the DMP led to improvements in glycemic control and subsequent completion of diabetes-related gaps in care in those patients enrolled in the DMP compared to patients not receiving this service.

Methods: This study underwent exempt review by the institutional review board. Information was extracted retrospectively from the electronic medical record; therefore, informed consent was not necessary. The study population consisted of those patients ≥ 18 years enrolled into the DMP as of August 1, 2014 with an A1C $\geq 9\%$. These patients belonged to 1 of 5 primary care offices that were selected to initially pilot the DMP service. The control group consisted of patients ≥ 18 years with an A1C $\geq 9\%$ who were not enrolled in the DMP at this time. These patients belonged to 1 of 5 offices that were matched to the study offices according to similar patient demographics. Patients were excluded from both populations if they were < 18 years, had a baseline A1C $< 9\%$, or if their A1C at 6 months was unavailable or > 1 year old from baseline. The primary objective was to assess the difference in mean A1C from baseline to 6 months in both populations. The secondary objectives were to assess the differences in completion rates of diabetes-related gaps in care at 6 months in both populations. A secondary subgroup analysis assessed the gaps in care completion rates at 6 months compared to baseline specifically within the study population.

2016 Summer Meetings Poster Abstracts

Results: 207 patients in the study population met the inclusion criteria as of August 1, 2014 versus 273 patients in the control group, with a baseline A1C of 10.29% and 10.17%, respectively ($P = 0.28$). Both populations demonstrated a similar percentage point reduction in A1C from baseline at 6 months (-0.84%, -0.91%, respectively; $P < 0.001$ for both populations). When glycemic control analysis was carried out over 13 months, the study population demonstrated an overall A1C reduction of -1.38 percentage points from baseline ($P < 0.001$). A similar value is unable to be calculated for the control population as both populations were receiving similar interventions beyond 6 months. Compared to the control group, patients enrolled into the DMP showed improvement in diabetes-related gaps in care completion rates at 6 months.

Conclusion: A team-based approach to managing high risk patients with diabetes led to similar glycemic control in both populations at 6 months. It is likely that 6 months was not sufficient time to demonstrate the clinical benefits of the DMP interventions. The the study population had a higher baseline A1C versus the control group (percentage point difference = 0.12), which may represent factors that were not accounted for, such as comorbidities, previous medication use, or other confounding variables. It is important to note that non-DMP clinical pharmacist interventions were already in place in both populations from baseline to 6 months.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 8-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Impact of pharmacist telephone follow-up calls on patients with chronic obstructive pulmonary disease discharged from hospital to home

Primary Author:

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Additional Author(s):

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April Moretto

Purpose: Chronic obstructive pulmonary disease (COPD) represents a major public health problem. In 2015, the Centers for Medicare and Medicaid Services established a payment penalty for unplanned 30-day COPD readmissions. In recent years, there has been increased interest in the benefits of continuity of care (COC) related to reducing complication risks, increasing compliance, improving preventive care, and decreasing medical care costs. Pharmacists play a major role in COC interventions. The purpose of this study is to characterize the types and frequencies of interventions and discrepancies that occur at transition of care in Medicare-insured COPD patients telephonically contacted by pharmacists post-discharge.

Methods: In an effort to address COC for patients suffering from COPD, our institution has implemented a pharmacist-led, telephone based transition of care post-discharge program. We evaluated Medicare insured patients discharged from any of the five hospitals within the Houston Methodist System throughout the greater Houston, Texas area between January 2014 and May 2015. Of note, each admission was considered as a separate patient encounter. We retrospectively reviewed patients' charts, records, and intervention documentation platforms. Discrepancies and interventions were classified under categories adapted from the American Society of Health-System Pharmacists (ASHP) statement of pharmaceutical care categories for medication-related problems and a previously published medication discrepancy tool. All patient demographic, baseline characteristics, and outcomes of medication discrepancies and interventions were summarized using frequency statistics.

2016 Summer Meetings Poster Abstracts

Results: A total of 345 patients with a principal diagnosis of COPD exacerbation were successfully contacted and formed our study population. The average time to the first post-discharge successful call was 9 days. Pharmacists offered COC services including disease state education and counseling to 266 patients (77 percent). Our results show that pharmacists were able to identify various medication-related problems, COPD and non-COPD related: 17 percent of patients were non-adherent, 12.5 percent failed to receive one or more of their discharge medications, 8 percent had improper drug selection, 6 percent had untreated indications, and 6 percent had adverse drug reactions. Incomplete and/or inaccurate medication reconciliations were detected in 57.5 percent of patients. Ninety one patients were current smokers, 57 percent of which received smoking cessation counseling. Pharmacists also offered counseling on other preventive care measures and monitoring parameters, recommended scheduling follow-up appointments, and assigned patients to care navigator coordinators for help with physician referral, updating patient contact information, or medical record transmission. Furthermore, pharmacists contacted physicians, insurance companies, home health agencies, durable medical equipment (DME) providers, and outpatient pharmacies in 95 (27.5 percent) patient encounters. Reasons for contact included: adding, modifying, or discontinuing therapy and following-up on the statuses of prescriptions.

Conclusion: Our results categorize the types and frequencies of interventions and discrepancies encountered; COC pharmacist follow up calls for COPD patients allowed identification, resolution, and prevention of actual or potential medication-related problems. The results of our study will potentially be utilized by the department of pharmacy to advise healthcare professionals at Houston Methodist System on actions to take during the hospital discharge process to optimize patients' safety and outcomes.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 9-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Multidisciplinary, pharmacist-led shared medical appointments for diabetes management in an adult internal medicine practice

Primary Author:

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Additional Author(s):

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Paige Carson

Harold Thomas

Purpose: Effective diabetes management requires significant focus on self-management skills. Efficiently providing ongoing education and support to patients proves challenging due to time and access constraints. Shared medical appointments (SMAs) have been explored as an innovative approach to delivering comprehensive care and education in a format that encourages patient interaction and multidisciplinary collaboration. The goal of this study was to assess the impact and long-term practicality of SMAs in an adult internal medicine office. The primary objective was to evaluate the effect of pharmacist-led SMAs on diabetes management. Secondary objectives included evaluating effects on diabetes-related health maintenance and patient satisfaction.

Methods: This prospective, observational, case-control, single-center evaluation included patients 18 years of age or older with diabetes or pre-diabetes. Weekly SMAs from October 2014 through April 2015 featured collaboration between a pharmacist and nurse practitioner (NP), with the support of a medical assistant and scribe. Each visit accommodated 3 to 6 patients in a 90-minute time-frame, during which each patient received education and individualized diabetes management in the presence of other patients. Measured outcomes included change in hemoglobin A1c, systolic blood pressure (SBP), and low-density lipoprotein (LDL) cholesterol; percentage of patients achieving A1c, SBP, and LDL goals; percentage of patients with appropriate use of low-dose aspirin, HMG CoA reductase inhibitor (statin), and ACE inhibitor (ACEi) or angiotensin receptor blocker (ARB) per diabetes guideline recommendations; and patient satisfaction with the SMA model. To assess impact on quality of care with pharmacist-led SMAs (n equals 33), changes in pre-specified endpoints were

2016 Summer Meetings Poster Abstracts

compared to two historical cohorts of patients who attended individual diabetes management appointments with a pharmacist (PharmD, n equals 33) or primary care provider (PCP, n equal 33) between October 2013 and April 2014. The hypothesis of this study was that outcomes associated with the SMA model would be comparable to those associated with one-on-one PharmD diabetes visits. This study was approved by the Institutional Review Board. All SMA participants signed confidentiality agreements prior to participation.

Results: Baseline demographics and use of health maintenance medications (aspirin, statin, and ACEi or ARB) were similar across groups. Average A1c was 8.4 percent in the SMA group, 7.9 percent in the PharmD group, and 6.6 percent in the PCP group. This was reduced by an average of 0.9 percent and 0.7 percent in the SMA and PharmD groups, respectively. SMAs resulted in numerically larger LDL and SBP reductions compared to other groups, with a 29.8 mg/dL average LDL reduction and 10.1 mmHg average SBP reduction versus 8.4 and 1 mg/dL reductions in LDL and 0.8 and 2.5 mmHg SBP increases in the PharmD and PCP groups, respectively. SMAs were successful at converting at least 60 percent of eligible patients to appropriate health maintenance medication use over the study period, compared with less than 50 percent in the PharmD group and less than 20 percent in the PCP group. On patient satisfaction surveys with a scale of 1 (least positive) to 5 (most positive), SMAs received an average rating of 4.7 or higher in each of eight categories, including 5 out of 5 in two categories. SMAs increased pharmacist utilization by at least 100 percent based on standard 60-minute appointment times.

Conclusion: SMAs resulted in increased patient interaction with providers and peers while providing similar outcomes compared with individual pharmacist-led diabetes visits. Through SMA participation, patients achieved lower A1c, LDL, and SBP values and increased utilization of guideline-recommended medications. SMAs offer an innovative and effective model for providing comprehensive diabetes care that is well-accepted by patients, and this model has the potential for increased revenue through improved pharmacist utilization. Study limitations included small sample size and use of retrospective controls. Due to the narrow time frame in which the study was completed, some endpoint data from the intervention group was missing.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 10-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Development and evaluation of a student-led approach to teaching ambulatory care pharmacy service development

Primary Author:

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Additional Author(s):

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Deborah Zeitlin

Jessica Triboletti

Alison Walton

Purpose: Due to the relative short time frame of Advanced Pharmacy Practice Experiences (APPE), a one month experience at an ambulatory care setting is commonly concentrated with providing direct patient care and medication management and less focused on pharmacy service development. With the field of ambulatory care pharmacy expanding and new services being developed to meet various outcome measures, a pharmacy student's understanding of the service development process is becoming more important. In an effort to help students appreciate and understand the role of the ambulatory care pharmacist in developing new clinical services, a 3-hour student-led seminar was developed.

Methods: In the 2015-2016 school year, P4 professional students completing an ambulatory care APPE with a Butler University faculty member were required to participate in a 3-hour student-led seminar on campus. Before attending the seminar, students were assigned a topic of ambulatory care to review and present to their peers; topics included standards of ambulatory care, collaborative drug therapy management agreements (policy/procedure), determining how to provide an ambulatory care service, billing basics of ambulatory care, and building support for your service. In addition, students were provided learning objectives and resources previously developed by faculty to utilize as they prepared their discussion. Once all topics were presented, the two groups were assigned the task to create their own ambulatory care service using the information provided in the seminar. Each group had a chance to present to the "C-suite" (faculty in charge) and their services were judged based upon pre-specified criteria in order to further engage the students. Students' knowledge of ambulatory care

2016 Summer Meetings Poster Abstracts

service development was assessed before and after the seminar to assess change. In addition, student feedback was collected following each seminar. Both knowledge-based questions and feedback was received via online surveys, collected anonymously. Students were not required to complete either survey in order to participate in the seminar and IRB approval from Butler University was obtained prior to survey dissemination.

Results: From May 2015 to April 2016, 64 students participated in the ambulatory care student seminar. Fifty-three students completed the pre-seminar survey and 59 completed the post-seminar survey. There was an increase in percent of correct responses for 9 out of the 10 knowledge based survey questions, with a range of 6 – 42% increase in the number of correct responses from pre- to post-seminar. The multiple choice question, What is the first step in providing a new ambulatory care pharmacy service?, resulted in a 2% decrease in the number of correct responses post-seminar as compared to the pre-seminar survey. In the post-seminar survey, 93% of student respondents agreed or strongly agreed that they had a good understanding of steps taken to develop a new ambulatory care pharmacy service and 93% would recommend this seminar to future students on ambulatory care rotations.

Conclusion: Overall, student understanding of ambulatory care pharmacy services improved following attendance of the student-led seminar. This seminar allowed students the opportunity to teach their peers as well as provided a focused time for discussion of a complex topic of service development. Student feedback indicated the seminar was beneficial in explaining the functions of their ambulatory care APPE site as well provided a good overview of how the services they were participating in were previously developed. Based on this positive feedback and the improvement in knowledge based assessment questions, the ambulatory care seminar will be continued for future APPE students.

2016 Summer Meetings Poster Abstracts

Submission Category: Ambulatory Care

Session-Board Number: 11-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Treatment of vitamin D deficiency in an integrated mental health/primary care clinic

Primary Author:

Silu Zuo, University of Arizona College of Pharmacy

Additional Author(s):

Jill Augustine

Martha Fankhauser

Purpose: Vitamin D deficiency is a prevalent problem, affecting about one billion people worldwide. Low 25-hydroxy-vitamin D (25(OH)D) levels have been linked to osteoporosis, psychiatric and neurological disorders, metabolic-related conditions, and many other medical conditions. Patients with mental illness are at higher risk for chronic diseases such as diabetes and cardiovascular disease, so optimizing their 25(OH)D levels is desirable to improve both physical and psychiatric conditions. The purpose of this study was to evaluate the management of vitamin D deficiency in patients of an integrated mental health/primary care clinic.

Methods: A retrospective electronic medical record review was conducted including patients at least 18 years old who were not pregnant, did not have end-stage renal disease, and who completed the Wellness Program at Assurance Health and Wellness Center (AHWC) between 9/1/2014 and 10/31/2015. Vitamin D deficiency is defined as 25(OH)D level < 30 ng/mL. The primary endpoint was the number and proportion of patients who achieved 25(OH)D levels 30 ng/mL or greater after starting vitamin D supplementation. Secondary endpoints included the number/proportion of patients with two or more 25(OH)D levels, number and proportion of patients started on vitamin D supplementation with a repeat level, time between levels, number and proportion of patients with vitamin D prescriptions initiated by an AHWC provider, and dosing regimens of vitamin D. Descriptive statistics were used to analyze these endpoints. This study was IRB-approved as a retrospective review by the authors' affiliated university.

Results: Sixty-eight patients (53 percent female) were included in the study, with mean age of 49 (standard deviation 13) and body mass index of 31.7 kg/m² (standard deviation 8.5 kg/m²). Fifty-three patients had medical comorbid conditions, the most common being hyperlipidemia

2016 Summer Meetings Poster Abstracts

(47 percent), hypertension (44 percent), arthritis (19 percent), and diabetes (18 percent). Sixty-three patients had at least one psychiatric condition, the most common being depression (44 percent), generalized/unspecified anxiety (34 percent), and post-traumatic stress disorder (21 percent). Eighty-eight percent of patients (N=60) had an initial 25(OH)D level, of which 66 percent (N=40) had levels less than 30 ng/mL. Of the patients identified as vitamin D-deficient, 60 percent (N=24) had vitamin D supplementation initiated. Overall, 31 patients had a vitamin D prescription initiated by an AHC provider. Of these patients, 11 (35 percent) had a repeat 25(OH)D level drawn after a mean of 163 days (range 35-357). Only 4 of these 11 patients achieved a 25(OH)D level of 30 ng/mL or greater. The most commonly prescribed vitamin D dosing regimens included vitamin D3 2000 international units (IU) daily (52 percent of all prescriptions) and vitamin D3 5000 IU daily (32 percent).

Conclusion: Initial vitamin D deficiency screening is performed for nearly all patients at AHC, but treatment with vitamin D and monitoring of 25(OH)D levels varied substantially. Appropriate monitoring of 25(OH)D levels after initiation of vitamin D supplementation appears to be the most considerable barrier. These results will be used to help improve current practice of treating vitamin D deficiency.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 12-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Failure Mode Effect Analysis (FMEA) for ePrescribing workflow

Primary Author:

Connie Saltsman, HCA

Additional Author(s):

Risa Rahm

Melissa Weaver

Marilyn Williams

Purpose: Meaningful Use has prompted the implementation of ePrescribing for both controlled substances and non-controlled substances. In order to better understand the functionality of ePrescribing, the impact to the clinicians' workflow and the impact to discharge medication reconciliation, a multi-disciplinary team was convened to complete a Failure Mode Effect Analysis (FMEA).

Methods: A multi-disciplinary team consisting of physicians, nurses, pharmacists, informaticists and project managers convened to evaluate ePrescribing. The team met on a weekly basis over a few months to complete a FMEA on ePrescribing. The FMEA included an evaluation of both the technical build and maintenance aspects of ePrescribing, as well as the clinical impact to the provider, nurse and pharmacist workflow. Pharmacy informaticists coordinated the FMEA. A demo of the current functionality was presented, and the group walked through a Visio diagram of the clinical workflows. Each point of failure was identified, and, using the FMEA framework, was given a score to evaluate its impact. The team also identified potential change requests for the EHR vendor to help to improve the software, in both build/maintenance and end-user workflow/satisfaction.

Results: By using a multi-disciplinary team to complete the FMEA evaluation, the team was able to identify which clinician(s) would be responsible for each of the steps in the process. Each of the failure points identified will be incorporated into the training required for each clinician group. The potential change requests for the EHR vendor are under review with the pharmacy informatics team. We have received a recent upgrade to our EHR system and are evaluating if any of our change requests have already been incorporated into the update.

2016 Summer Meetings Poster Abstracts

Conclusion: The FMEA process provided essential information to our ePrescribing implementation project. It allowed our team to better understand the full functionality of the ePrescribing process, both in the technical build and maintenance aspects, as well as the impact to clinician workflows. Having the multi-disciplinary team together in the same room was essential to the process so that the entire team could identify which clinician would be responsible for each of the steps in the workflow. Due to the integrated nature of discharge medication reconciliation and the entire discharge process, this was an important step in the planning of the implementation.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 15-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Establishing quality metrics for barcode-assisted medication preparation technology

Primary Author:

Sarah Stephens, Kaweah Delta Health Care District

Additional Author(s):

Katie Olson

Chris Patty

Purpose: The pharmacy department implemented barcode-assisted medication preparation (BCMP) technology to reduce the risk of error related to parenteral drug compounding. To optimize this technology, a dashboard was created to monitor use of the BCMP system to prepare doses. No national benchmarks are currently available.

Methods: A task force was created to review data available within the BCMP software system. Best practices and available literature were reviewed to determine acceptable bypass rates for BCMP technology. Current reasons for bypasses were evaluated and defined for the organization. Quality metrics and reporting structure were determined based on this information with oversight from the organization's Medication Safety Committee.

Results: Unlike other technologies used during the medication use process, no benchmark data are available to define an acceptable bypass rate for BCMP technology. System limitations require a certain percentage of acceptable bypasses which was accounted for when selecting bypass goal. A goal of less than 10% was chosen for the department based on data available over the most recent quarter and known system limitations that prevent 100% use of BCMP during parental drug compounding. A dashboard representation of these data was created and will be reviewed monthly at the Pharmacy Quality Assurance meeting and quarterly at the Medication Safety Committee. A process for reviewing bypasses occurs weekly within the department.

Conclusion: Use of BCMP technology is limited, and therefore, lacks benchmark data to help organizations track and trend quality metrics against other institutions. However, increased use

2016 Summer Meetings Poster Abstracts

of this technology is expected as it is essential for safe medication preparation and is being promoted by leaders in medication safety. Organizations should develop their own metrics based on their data and implementation plan and are encouraged to share information via publication and professional meetings. A national standard should be encouraged and supported by BCMP vendors to optimize patient safety.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 16-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Optimization of dosing alerts to reduce alert fatigue

Primary Author:

Jessalynn White, UMass Memorial Medical Center

Additional Author(s):

Purpose: Clinical Decision Support (CDS) enhances health care related decisions by displaying important clinical knowledge. When a computerized alert is presented at the correct time, CDS can be an effective tool. When alerts occur too frequently or present irrelevant information, alert fatigue may occur. This analysis reviewed alerts generated and their appropriateness. The primary objective was to reduce the number of minimum and maximum dosing alerts for high risk, high alert, and high volume medications. The secondary objectives of this study were to decrease clinically irrelevant minimum and maximum dose alerts and improve the number of perceived clinically relevant dose alerts.

Methods: This was an interrupted time series analysis where alert reports were compiled for three random time frames chosen before and one time frame after optimization changes. The data comprised of all min/max dosing alerts fired during a particular time frame. Each time frame chosen consisted of 6 consecutive days. The reports retrieved contained information on specific alerts generated on medications entered by pharmacists. Researchers reviewed the reports to determine trends and specific medications to target for optimization. Medications that were high alert, high risk, and high volume were approached first. There were 10 medications selected. When reviewing, investigators determined clinical appropriateness of the alert fired based on clinical evidence and pharmacists' recommendations. If the alert generated was not appropriate, then investigators determined which specific minimum or maximum dose settings caused the alert to fire and an intervention was made. An intervention consisted of changes to min/max dose alert settings in the pharmacy computer system. Researchers collaborated with clinical informatics pharmacists to revise and optimize alert settings for the medications chosen. These reports were deidentified to protect patient privacy. No medical records were reviewed and IRB approval was exempt. When reviewing data, the alerts generated within the three time frames were averaged and then compared with post-intervention data to determine an average reduction.

2016 Summer Meetings Poster Abstracts

Results: There were a total of 13,593 min/max dose alerts generated during the three 6 day time frames chosen before the intervention for all medications, which yielded an average of 4,531 alerts over a 6 day period. Ten medications were included for review including: calcium, diazepam, enoxaparin, fentanyl, heparin, insulin, magnesium, midazolam, naloxone, and nitroglycerin. Specifically reviewing these 10 medications chosen for optimization, there were a total of 6,646 min/max dose alerts noted within the three 6 day time frames. This yielded an average of 2,215 dosing alerts over a 6 day period. Post intervention, there were a total of 3,559 min/max dose alerts generated in the 6 day time frame and 696 alerts seen in the 10 medications chosen for optimization. When reviewing the ten medications chosen for optimization, this resulted in a reduction of 1,519 alerts (68.6%). There was a reduction in 942 alerts (21.5%) seen when reviewing all alerts generated

Conclusion: This study has shown by reviewing minimum and maximum alerts, it is feasible to optimize these alerts. The ten medications chosen were associated with 48.8% of all alerts. With an average reduction of 21.5% on all alerts, this optimization may reduce alert fatigue among end users of the system.

2016 Summer Meetings Poster Abstracts

Submission Category: Automation/ Informatics

Session-Board Number: 17-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Associating e-prescribed medications with diagnosed indications in the EHR using a medication-indication matching resource

Primary Author:

Taylor Woodroof, Vanderbilt University Medical Center

Additional Author(s):

Wing Liu

Scott Nelson

Purpose: Patient data in electronic health records (EHRs) is highly related, despite frequent, disparate documentation, storage, and display. The use of separate lists for medications and diagnoses is one such example; therefore, the association between medications and indications often eludes common practice but is critical for medication reconciliation and medication therapy management. The objective of this study was to describe the number of electronically prescribed medications with a probable match to a diagnosed indication on the patient's problem list within EHR, as well as the number of diagnosed indications on the patient's problem list with a probable electronic prescription medication match.

Methods: We did a retrospective health record review at Vanderbilt University Medical Center of a de-identified dataset of medications e-prescribed from 1/1/2015 to 6/30/2015 along with their respective patient problem lists. To be included, patients had to have ≥ 2 visits in the past year, and ≥ 1 e-prescribed medication within the study period.

We used MEDI (MEDication Indication) to link medications and possible indications. MEDI is an open-source dataset which integrates medication-indication information from four public medication resources- RxNorm, Side Effect Resource (SIDER), MedlinePlus, and Wikipedia.¹ The MEDI High Precision Subset (HPS) is a smaller set of medication-indication pairs found either within RxNorm, or at least two of the other three resources.

We mapped medications from First Databank codes to RxNorm generic drug ingredient names (RxCUI_IN term type). Prescriptions were excluded if they contained multiple ingredients or could not be mapped to RxCUIs. Diagnoses from problem lists were mapped from SNOMED CT terms to ICD-9 codes in order to match with MEDI. We then linked each patient's electronic prescriptions and problem list diagnoses using MEDI (MEDI_01212013) and MEDI-HPS

2016 Summer Meetings Poster Abstracts

(MEDI_01212013_HPS) relationships. We randomly selected 30 patients for an independent manual review by two pharmacists to match clinically probable medication-indication pairs and establish a gold standard for comparison. We compared results from the MEDI matching against the gold standard and calculated precision, recall, and descriptive statistics.

Results: There were 62,191 patients included in the study with 270,045 electronic prescriptions within the study period and 424,989 diagnoses documented in their EHR problem lists. Using MEDI, 61.3% of electronic prescriptions had a diagnosed indication match in the problem lists, while 37.3% of diagnoses had an electronic prescription medication match. Using MEDI-HPS, 37.5% of electronic prescriptions had an indication match, whereas 21.2% of diagnoses had an electronic prescription match. MEDI demonstrated a precision of 47.0% for prescription matching and 51.1% for diagnosis matching. Precision for prescription matching utilizing MEDI-HPS was 79.2%, and 68.9% for diagnosis matching. Recall for MEDI prescription matching was 57.4% and 58.8% for diagnoses matching, and 95.5% for prescriptions and 94.0% for diagnoses using MEDI-HPS. MEDI and MEDI-HPS matches occurred for 61% (n=47,892) and 36.8% (n=28,735) of the top 20 most e-prescribed medications, respectively. MEDI matches occurred for 47.9% (n=60,366) of the top 20 most documented diagnoses on a patient's problem list. MEDI-HPS matches occurred for 32.9% (n= 41,434).

Conclusion: MEDI-HPS, which demonstrated a high level of precision in this and previous studies, found low medication-to-indication matching. This suggests that medication indications are infrequently documented on the problem list, and that not all potential indications on the problem list are treated using medications. Further research is recommended to explore medications and indications that did not match, particularly high-risk medications, and determine if MEDI-HPS can be refined to reach an even higher precision. Electronic prescribing, medication reconciliation, and diagnoses documentation applications within EHR could incorporate matching resources to infer medication-indication relationships and facilitate thorough documentation before and during transitions of care.

2016 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 18-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation and expansion of a standard process for monitoring of direct oral anticoagulants (DOAC) in an outpatient anticoagulation clinic

Primary Author:

Elizabeth Koczera, Boston Medical Center

Additional Author(s):

Victoria Liu

Kieran Fennell

Purpose: Pharmacist monitoring of vitamin K anticoagulants has been recognized as an effective practice because routine pharmacist monitoring has shown to improve therapeutic outcomes and reduce healthcare costs. Monitoring of direct oral anticoagulants (DOAC) is currently not standardized. Pharmacist monitoring of patients prescribed DOACs could increase adherence and address medication errors before adverse events occur. The primary objective of this project was to establish a standard process for anticoagulation clinic monitoring of patients on DOACs. This project involved training all anticoagulation clinic pharmacists to monitor DOACs and the service was expanded to include patients referred from Family Medicine and Cardiology departments.

Methods: Patients referred for monitoring were scheduled for initial teaching appointments with a pharmacist. Subsequently, the follow-up process included phone or chart reviews at regular intervals to identify adverse effects, answer patient questions, provide counseling, determine adherence, and review dose appropriateness. Pharmacists documented interventions made and scheduled patient's next follow-up date. The process was regularly reviewed to quantify patient volume, review adherence to follow-up process, and identify areas for improvement. Data collected included number of referrals, reported adverse effects, medication errors, interventions, missed follow up, and medication adherence. Continuous review of patient referrals and the monitoring process determined the quality of the standard monitoring process.

Results: Interventions by pharmacists included providing patient counseling, appointment reminders, contacting the physician, dose adjustment, and refilling medication as indicated. The

2016 Summer Meetings Poster Abstracts

monitoring process was evaluated periodically during the study period in order to refine the standard process and perform appropriate interventions when adverse bleeding and thrombotic events were identified. Adjustments to the monitoring process included contacting physicians when patient non-adherence was identified or patients were lost to follow up. Additionally, 42 week follow up date was extended to 48 weeks to better align with prescription and prior authorization renewals. An increase in patient referrals was seen throughout the process with minimal patients lost to follow-up. As the number of patients scheduled each week for follow-up steadily increased, time spent per patient follow-up remained consistent. Increase in pharmacist involvement and adherence to the monitoring procedure was seen from the initiation of this project through regularly scheduled focus group meetings and initial pharmacist training. In addition to process adjustments and increases in patient referrals, documentation of pharmacist interventions was standardized and included in the patient's electronic medical record for every follow-up encounter.

Conclusion: Regular monitoring of patient's prescribed DOACs by pharmacists in an outpatient anticoagulation clinic resulted in numerous interventions that promoted patient adherence and identification of potential barriers to successful therapy with DOACs. The standard monitoring process for patients referred was followed by all anticoagulation pharmacists and was refined through continuous review of interventions being made. The refined process resulted in appropriate pharmacist interventions that promoted quality patient care.

2016 Summer Meetings Poster Abstracts

Submission Category: Cardiology/ Anticoagulation

Session-Board Number: 19-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Incorporation of influenza immunizations into an anticoagulation clinic workflow

Primary Author:

Ashley Van Allen, MultiCare

Additional Author(s):

Wontae Lee

Monica Louie

Hang Pham

Jay Wirawan

Purpose: The Advisory Committee on Immunization Practices recommended annual influenza vaccination for all persons six years and older without contraindications for the 2015-2016 influenza season. Patients taking warfarin who contract influenza are at increased risk of bleeding due to decreased appetite, fluid loss, and stress to the body; therefore, it is important that warfarin patients receive yearly influenza vaccines. This project was designed to incorporate the administration of influenza vaccines into an anticoagulation clinic (AC) workflow.

Methods: A pharmacist with board certification in ambulatory care pharmacy updated the outpatient pharmacist collaborative protocol for immunizations and included pharmacists working in the AC. In preparation to provide vaccines, pharmacists participated in an internal six-hour vaccination review course provided by nurse educators or an external immunization program from the state or a national organization. Programs included didactic lectures and practicum training. A 2015-2016 influenza vaccine update was presented at a staff meeting. AC staff included four full-time pharmacists and two anticoagulation assistants who provided check-in and administrative support. A workflow was developed in which anticoagulation assistants asked each patient about influenza vaccine status at check-in and helped facilitate the paperwork which included a questionnaire about vaccine contraindications and the Vaccine Information Sheet. Patients completed the paperwork while waiting in the lobby. Once the patient was called into the exam room, the AC pharmacist would review the questionnaire to determine appropriateness of vaccine administration. The influenza vaccine was provided within the same 15 to 20 minute AC visit.

2016 Summer Meetings Poster Abstracts

Results: The AC had an average panel of 1620 patients. Between September and December 2015, 540 influenza vaccines were given, which represents roughly 1/3 of the AC's population. Monthly productivity for the clinic remained the same without any decreases in budgeted visit volumes. The influenza vaccines and administrations added additional revenue to the clinic. Anecdotal comments from patients indicated that they were pleased with the immunization service and it saved them an extra trip to the pharmacy or physician's office.

Conclusion: Anticoagulation clinics can effectively incorporate influenza vaccine administration into the routine visit workflow.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 20-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Choosing wisely: pharmacy's role in effective use of medications

Primary Author:

Lydia Noh, Cedars-Sinai Medical Center

Additional Author(s):

Rita Shane

Purpose: The primary objective of this study is to determine drug-related problems identified and resolved based on 9 Pharmacy Choosing Wisely recommendations in a recently published American Journal of Health-System Pharmacists (AJHP) article. The purpose is to determine opportunities to reduce overuse of treatments according to Pharmacy Choosing Wisely recommendations. The results will be used to educate the providers and patients and draw attention to the common medications that are prescribed inappropriately.

Methods: Pharmacy residents prospectively reviewed 75 patients admitted to an inpatient service from October 2015 to March 2016. Each applied the nine Choosing Wisely recommendations to engage providers and patients in discussion about reducing overuse of low-value medication treatments. The descriptive statistics (count and frequency) of each recommendation was assessed across all patients. Data collection included the following: frequency of BEERS medications discontinued or modified when applicable for patients over 65 years old, medications optimized (decreasing dose, finding alternatives) based on laboratory data or clinical status, empiric antibiotics discontinued if not indicated, antibiotic de-escalation or escalation based on cultures and clinical status, errors based on prior to admission (PTA) medication list, discontinued orders if not indicated, herbals discontinued prior to surgery, discontinued herbals or over-the-counter medications that cause drug-drug interactions, inappropriate prescribing (i.e. timing in reference to procedure, dose, renal function), discontinued medications if used to manage symptoms rather than underlying cause, and discontinued proton-pump inhibitors without appropriate indication.

Results: The residents reviewed a total of 75 patients during their staffing shifts from October 2015 to March 2016. Among the 75 patients, there were 149 possible Choosing Wisely recommendations that the residents intervened on. The acceptance rate was 79% for the

2016 Summer Meetings Poster Abstracts

interventions and 100% of the patients had at least 1 Choosing Wisely intervention made by pharmacists. The most common intervention was at a rate of 23%, which was for the orders that required dosage reduction, discontinuation, or another medication, avoiding initiation of an unnecessary medication. 45% of the patients had one or more orders discontinued due to drug interactions or inappropriate use.

Conclusion: The results from the study demonstrate that the Pharmacy Choosing Wisely recommendations serve as a tool to reduce misuse and overuse of medications in the inpatient setting. The methods applied in the study was proven to be practical by the residents, feasible to perform during staffing and patient chart reviews. The study results show that all patients reviewed by a pharmacist has at least one Choosing Wisely recommendation that can be applied to the patients with a high acceptance rate from the providers. The next step is to apply ASHP Pharmacy Choosing Recommendations at other institutions and various practice settings.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 21-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Conversion of non-formulary to formulary drug equivalents based on drug and dose conversion tables for each drug class at a large academic medical center

Primary Author:

William Ruspantini, NYU Langone Medical Center

Additional Author(s):

Movses Hovsepian

Purpose: The safety, efficacy and cost-effective benefits of formulary drugs in an institution should be based on scientific evidence and practice guidelines. However, providing the best choice of drugs for each class does not necessarily address all aspects of drug conversion, especially with regard to dose equivalency. Providing this information when converting to a formulary drug can often be very time consuming, inconsistent or inaccurate.

The purpose of this study was to evaluate whether streamlining the formulary to several drugs within a class and using a drug-dose equivalency table would minimize the number and cost of non-formulary orders for each class.

Methods: With the approval of the P&T committee the pharmacy department did a 12 month retrospective review of the purchase orders and cost of all drugs within a class (i.e. proton pump inhibitors) to determine the incidence and duration of use. In addition, a literature search for the appropriate drug and dose equivalency within each class of drugs was reviewed between the medical specialists for that class and the pharmacy. Once a consensus was reached as to which drugs should be on the formulary for each class, a drug-dose equivalency table between the formulary and non-formulary (NF) drugs was prepared and presented to the P&T committee for approval. The approved table of formulary drugs and their dose equivalents to NF drugs for each class was then uploaded to the pharmacy's PC work stations and used as a reference in converting NF drugs to the formulary drug dose equivalent by the verifying pharmacist. This was complemented with ongoing staff education as more drug classes and their dose equivalents were approved. The primary endpoint was the percentage of successful NF to formulary drug conversions by the staff for each of the 2 quarterly periods (Sep to Nov,

2016 Summer Meetings Poster Abstracts

2013 and Dec to Feb, 2014). The secondary endpoints were the percentage reduction of NF drugs used for all classes between quarters and their cost savings.

Results: At the time of this study, there were 8 classes, each with a drug-dose equivalency table between formulary and NF drugs approved by P&T and instituted in our practice (i.e. PPIs, ACEI, ARBS, H-2antagonists, bladder muscarinic antagonists, bisphosphonates, 2nd generation antihistamines and uric acid antagonists). With regard to the primary endpoint in quarter 2013, a 164 NF drugs were prescribed, of which 147 or an average of 93% were converted by the pharmacy staff to the appropriate drug-dose formulary equivalents. In quarter 2014, there were only 17 NF drugs prescribed of which a 100% were converted.

The secondary endpoints for the percentage change in the number of NF drugs prescribed between quarters, showed a 95% reduction in the total number of NF drugs prescribed in quarter 2014. Additionally, with regard to cost, \$438 was saved in quarter 2013 and about \$23 in quarter 2014. The latter quarter had substantially less cost savings due to the dramatic reduction in NF drugs prescribed.

Conclusion: Streamlining the formulary to several drugs within a class and using a drug-dose equivalency table to switch prescribed NF drugs to an appropriate formulary drug and dose equivalent reduces the number of NF drugs used in practice and spares the pharmacy budget any unnecessary costs. In addition, it facilitates staff compliance, drug/dose accuracy and time efficiency as demonstrated by the pharmacist's greater than 90% conversion rate between NF to formulary drugs in both quarterly periods.

2016 Summer Meetings Poster Abstracts

Submission Category: General Clinical Practice

Session-Board Number: 22-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Are mini-tablets easy to take? — A clinical trial for evaluating the ease of taking mini-tablets in healthy volunteers

Primary Author:

Shinya Uchida, University of Shizuoka, School of Pharmaceutica Sciences

Additional Author(s):

Sayuri Nakajima

Yoshiyuki Hayakawa

Noriyuki Namiki

Purpose: Tablets are the most widely used drug formulation. However, problems may arise in pediatric or elderly patients, whose swallowing functions are inferior. Mini-tablets (MTs) are considered easier to swallow than conventionally sized tablets (CTs). Although several trials suggest that MTs are the most acceptable oral formulation, reports comparing MTs with other tablet formulations and quantitative data for the ease of intake of a unit of several tablets are lacking. We aimed to evaluate the ease of taking MTs in comparison with that of other tablet formulations, as well as to evaluate the ease of taking different numbers of MTs.

Methods: We prepared 4 types of tablets in 2 diameters (3 mm for MTs and orally disintegrating mini-tablets (ODMTs) versus 8 mm for CTs and orally disintegrating tablets, ODTs) and two formulations (MTs and CTs versus ODMTs and ODTs). Eighteen healthy volunteers (8 men and 10 women; aged 22.5 plus or minus 1.0 years) were asked to take 1 MT and 1 CT with drinking water. For an ODMT or ODT, they were asked to drink water after these tablets had disintegrated in the oral cavity. Subjects drank the minimum volume of water required to take each tablet smoothly and the amount of water consumed was measured. Thereafter, they were asked to evaluate the ease of tablet intake using a visual analog scale (VAS), with the maximum difficulty marked at 100 mm. In the second trial, all volunteers randomly took 1 CT or 1 unit containing 1, 2, 5, or 10 MTs with water. Ten MTs and 1 CT were equivalent in weight. After drinking water, the amount of water required and VAS score for the ease of intake of each unit of tablets were measured using the same methods as described for the first trial. The study protocol was approved by the Ethics Committee of the University of Shizuoka, Japan.

2016 Summer Meetings Poster Abstracts

Results: Of the formulations tested, 1 CT had the highest score for intake ease, and the score differed significantly from that of 1 MT (9.0). The VAS score for 1 ODT was significantly higher than that for 1 MT, but 1 MT was not significantly different from that of 1 ODMT. The median amounts of water required for 1 ODMT and 1 CT intake were significantly lower and higher than that for 1 MT intake, respectively. The VAS scores for the ease and amount of water required for intake of 1 CT or 1 unit of MTs (1, 2, 5, and 10) were measured. VAS scores for the ease of intake for 1 MT and 2 MTs were significantly lower than that for 1 CT. The VAS score for a unit of 5 MTs was similar to that for 1 CT, and that for a unit of 10 MTs was slightly higher than that for 1 CT, but the difference was insignificant. The median amounts of water required for intake of 1 MT and 2 MTs were significantly lower than that required for 1 CT.

Conclusion: The VAS scores for the ease of intake and amount of water required for MTs were significantly lower than those for CTs. MTs could be taken more readily and were more acceptable to volunteers. The advantages of MTs, namely the ease of intake and the low amount of water required, were the most prominent for a unit comprising less than 5 tablets. Thus, MTs could reduce the problems and risks associated with taking tablets and improve patient adherence, especially in pediatric and geriatric patients who have difficulty with taking CTs.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 23-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Evaluation of treatment eligibility and barriers among advanced liver disease (ALD) 7 hepatitis C veterans and reasons for early treatment discontinuation

Primary Author:

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Additional Author(s):

Jan Carmichael

Amy Robinson

Joy Meier

Purpose: Clinical hepatitis C virus (HCV) treatment guidelines emphasize the urgency of treating special populations, such as those with advanced liver disease (ALD). Treatment prioritization is a significant issue within the Veterans Affairs Health Care System. Currently, there is no methodology available to predict the percentage of a high risk HCV population that is treatment eligible. Primary outcomes of this study were to determine the percent of treatment eligible veterans with HCV and ALD within VISN 21 and assess characteristics and barriers to treatment. Secondary outcomes were to determine the number and characteristics of Veterans initiating but not completing treatment.

Methods: This multi-site, retrospective analysis was conducted within five VISN 21 medical centers located within California, Nevada, and Hawaii. Electronic health record information from VA medical centers is transformed and stored in a centralized SQL Management Studio data warehouse. Using this data, a clinical HCV population management dashboard was developed in 2012 for pharmacists and physicians with experience in treating HCV to population manage over 10,000 HCV patients. In August 2015 a tracking tool was added to the dashboard to facilitate capture of standardized data from clinician review. A menu of possible non- treatment reasons was used in documentation. Instructions were provided on how to record the treatment candidate status and reasons for treatment ineligibility. A cohort of Veterans aged 18 years or older with a confirmed diagnosis of HCV and a documented clinical review performed between August and November 2015 was analyzed. Baseline characteristics and demographics for the treatment eligible and ineligible cohorts were obtained through database queries. For the secondary outcome database queries identified

2016 Summer Meetings Poster Abstracts

Veterans that had initiated direct acting antiviral therapy during fiscal years 2015-2016. Veterans that discontinued therapy prior to completing at least 8 weeks of treatment were identified. Preliminary characteristics of the Veterans discontinuing treatment early were collected; review of reasons for treatment discontinuation through the electronic medical record is ongoing. This study received IRB exemption as a quality improvement project.

Results: Of 1003 Veterans reviewed for the primary outcome, 478 (48%) met criteria for receiving HCV treatment. Some 525 (52%) Veterans were not treatment eligible at the time of review. The most common reasons identified for treatment ineligibility included: active alcohol use, 116 (22%), unstable/uncontrolled comorbidity, 108 (21%), and patient refusal of treatment, 64 (12%). In both groups the population was predominantly male and the mean age of both groups was the same at 64.6 years. The reviewed population had ALD on the basis of their FIB-4 scores, with mean FIB-4 scores for the treatment eligible and ineligible groups of 4.8 and 5.4, respectively. The treatment-ineligible group had proportionally fewer treatment naïve Veterans 465 (88.6%) compared to the treatment-eligible group with 432 (90.4%). Other baseline characteristics and demographics were comparable between the groups. For the secondary outcome, 95 out of 1659 Veterans (5.7%) were identified as discontinuing treatment early. The mean age of Veterans that discontinued early was 63 years and mean FIB-4 score was 3.7. Within the year prior to their last prescription, 13 Veterans had an encounter with ICD9/ICD10 codes for alcohol abuse and 19 had an encounter for substance abuse.

Conclusion: This project identified that over half of reviewed HCV infected Veterans with advanced liver disease may not be treatment eligible. Within this Veteran population, ongoing active alcohol use and the presence of uncontrolled comorbidities were the most commonly reported reasons for treatment ineligibility. Based on this analysis, resources should be focused on treatment of alcohol use disorder and treating modifiable barriers to treatment. Six percent of Veterans initiated on therapy discontinued treatment early. Analysis is ongoing to determine reasons for treatment discontinuation.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 24-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Impact of an antimicrobial stewardship program(ASP) on unnecessary double anaerobic coverage(DAC)

Primary Author:

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Additional Author(s):

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Junghwa Lee

Eunsook Lee

Hong Bin Kim

Purpose: Co-administration of two or more antimicrobials with anti-anaerobic activity is not recommended except in certain circumstances. We therefore conducted an intervention to reduce unnecessary double anaerobic coverage (DAC) prescription.

Methods: The intervention consisted of education using an institutional intranet and prospective audits and feedback provided through collaboration between a pharmacist and an infectious diseases physician in Seoul National University Bundang Hospital, a tertiary hospital in Seongnam, Republic of Korea, in 2013. The study period was 1 year which contained 6 months of pre-intervention period and 6 months of intervention period. To estimate the overall effect of the intervention, we compared the monthly number of patients receiving unnecessary DAC for more than 3 days and the proportion of patients receiving unnecessary DAC for more than 3 days among all patients receiving DAC.

Results: The average monthly number of patients receiving unnecessary DAC for more than 3 days after screening decreased by 73.9% in the intervention period from 26.8 to 7.0. Wilcoxon rank sum test revealed there was a significant statistical difference in the monthly number of patients receiving unnecessary DAC for more than 3 days ($P = 0.005$). The proportion of patients receiving unnecessary DAC for more than 3 days after screening among all patients identified as receiving necessary or unnecessary DAC also decreased by 67.8% in the intervention period from 42.3% to 13.6% ($P < 0.001$).

2016 Summer Meetings Poster Abstracts

Conclusion: The multidisciplinary antimicrobial stewardship program with combined methods reduced unnecessary DAC prescription successfully.

2016 Summer Meetings Poster Abstracts

Submission Category: Infectious Diseases

Session-Board Number: 25-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: System-wide approach to antimicrobial stewardship in a large community hospital based health-system

Primary Author:

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Additional Author(s):

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Trent Beach

Purpose: Since the release of the Presidential Executive Order on Combatting Antibiotic Resistance and the recommendation for the Centers for Medicare and Medicaid Services (CMS) to require hospitals to implement antimicrobial stewardship programs (ASP) as part of the Conditions of Participation (COP) by end of 2017, hospitals and healthcare providers are experiencing a sense of urgency to implement ASP at their facilities. Community Health Systems, a community-based hospital group with 195 hospitals across 29 states, is taking a system-wide approach to antimicrobial stewardship (AS). This system-wide initiative was designed to identify and correct gaps in the individual facility's antimicrobial stewardship program.

Methods: A multifaceted approach was developed system-wide in collaboration with pharmacists from CHS-affiliated hospitals led centrally by the professional services team. The system-wide approach took on six facets: stakeholders' buy-in, governance, data review and feedback, education, clinical surveillance, and technology integration. A system-wide antimicrobial stewardship task force (ASTF) was created in August 2014, consisting of multidisciplinary members. The ASTF serves as the governing body for the review of system-wide antimicrobial use metrics and approval body for system-wide policies and protocols. A system-wide survey to assess individual facility ASP baseline was performed in October 2014 and a one-year progress follow-up in October 2015. These surveys assessed hospitals on adherence with the Center for Disease Control and Prevention (CDC) Core Elements for Hospital ASP document, including thirteen elements from their published checklist. Based on the results

2016 Summer Meetings Poster Abstracts

of the surveys, a tracking database was developed and made available to all directors of pharmacy within the health-system to assess ASP implementation progress. Educational opportunities were provided to all health-system pharmacists through support to pursue the Society of Infectious Diseases Pharmacists (SIDP) Antimicrobial Stewardship certificate program as well as a monthly antimicrobial stewardship topic specific education webinar developed by members of ASTF. The use of clinical surveillance systems were further optimized to facilitate pharmacists' review of antimicrobial stewardship related interventions.

Results: The one-year interim progress survey validated the success of the system-wide antimicrobial stewardship initiative. The number of facilities with selected CDC core elements in place has increased 13 percent according to the interim progress survey. In addition, the number of facilities self-reporting issues with ASP implementation has decreased 11 percent. A total of 254 affiliated pharmacists enrolled in the SIDP training program to strengthen their infectious diseases knowledge. A newly implemented monthly antimicrobial stewardship education webinar had an average of 255 pharmacists (range 176 to 357) participate each month over the four months since inception. Pharmacists have increased their involvement in antimicrobial stewardship related clinical activity by 10.3 percent throughout the study period.

Conclusion: Our multifaceted system-wide approach to antimicrobial stewardship has demonstrated interim success in developing and/or enhancing the antimicrobial stewardship programs in individual facilities. Further developments include reducing inappropriate antimicrobial use and increasing multidisciplinary collaboration for the success of these antimicrobial stewardship programs.

2016 Summer Meetings Poster Abstracts

Submission Category: Oncology / Hematology

Session-Board Number: 26-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation of closed system transfer devices and environmental sampling at the Alaska Native Medical Center

Primary Author:

Ashley Schaber, Alaska Native Medical Center

Additional Author(s):

Purpose: To evaluate and implement closed system transfer devices and environmental sampling for hazardous medications in pharmacy and nursing areas.

Methods: A multidisciplinary team including Environmental Health, Infusion Center Nursing, and Pharmacy was created to review environmental sampling options, compare options to medication usage at the facility, and determine the location of each environmental surface test. The team also reviewed different closed system transfer device (CSTD) product options to determine the best fit for the facility. Once a product was selected, Pharmacy coordinated education for nursing and pharmacy staff members utilizing the devices.

Results: Seven environmental surface samples testing for carboplatin and oxaliplatin were performed including three areas in pharmacy (floor and counter in negative pressure room, inside negative pressure hood) and four areas in the Infusion Center (desk, floor by patient chair, medication room counter, floor in patient restroom). Baseline results showed most samples were under the quantitation limit with the exception of two oxaliplatin samples on the pharmacy floor and the Infusion Center medication room counter which were above the quantitation limit. Five closed system transfer device products were reviewed with one selected as the best fit for the facility. Seventy-five staff members were educated and assessed on use of the closed system transfer device. Follow-up environmental surface testing for carboplatin and oxaliplatin on the same seven sites in the pharmacy and the Infusion Center eight months after implementation of closed system transfer devices were below the quantitation limit for all sites, indicating an improvement from baseline.

Conclusion: Closed system transfer devices provide a safe, effective way to reduce employee and patient exposure to hazardous medications. Environmental surface testing should be

2016 Summer Meetings Poster Abstracts

performed at baseline prior to implementation of closed system transfer devices and routinely as recommended per national guidelines.

2016 Summer Meetings Poster Abstracts

Submission Category: Oncology / Hematology

Session-Board Number: 27-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Pharmacist-directed new chemotherapy education for patients in a community cancer hospital

Primary Author:

Inna Tsuker, Cancer Treatment Centers of America, ERM

Additional Author(s):

Justin Chura

Purpose: The relationship between patient education and patient safety has been well-established. Education by providers with in-depth knowledge of chemotherapy is a step forward to assuring patients are safe on the new chemotherapy agents that they are initiated on. Departments of Oncology and Pharmacy collaborated to improve patient's safety by providing education to the patients receiving a new chemotherapy regimen. The purpose of the project was to increase patient knowledge about chemotherapy in order to improve treatment satisfaction and outcomes. For Pharmacy, secondary goal was to increase patient centricity of pharmacists, and allow all pharmacists to have face-to face-interactions with patients.

Methods: Patients were included in the study if they were receiving a chemotherapy regimen for the first time. Once patient signed consent to start new chemotherapy, the Department of Pharmacy was notified of the agent to be initiated. Pharmacists prepared for patient education by reviewing patient's current medications, laboratory data, previous chemotherapy history, and new agents. Once the patient arrived in the Infusion Department, the pharmacist conducted detailed drug education for the patient, including but not limited to: common side-effects and their timing if appropriate, what to expect at home, when to contact their provider, selected measures to take at home to lessen adverse reactions, and brief discussion of the mechanism of action. Each patient was offered a comprehensive handout containing all pertinent information. The education activity was documented in the patient's chart, and the charge for medication therapy management was applied for outpatient patient education. In order to assess the quality of this initiative, a four-question survey was developed and provided to patients to complete. All pharmacists participated in the patient education process.

2016 Summer Meetings Poster Abstracts

Results: Over a hundred patients were seen and educated on their new chemotherapy regimens by the Department of Pharmacy during the study period. Per collected surveys, all patients reported that they learned new information about their chemotherapy treatment during the meeting with the pharmacist. Additionally, all patients reported that they found value in the information provided regarding their chemotherapy regimen. Patients noted that overall, pharmacists were knowledgeable, and that meeting with pharmacist was of a value.

Conclusion: Chemotherapy is considered a high-risk medication. This study demonstrates a unique way to improve patient knowledge on the chemotherapy by introducing education with the pharmacist in the setting of Infusion Center. Patients receiving intravenous chemotherapy can greatly benefit from additional helpful information about their new regimens.

2016 Summer Meetings Poster Abstracts

Submission Category: Pain Management/Palliative Care

Session-Board Number: 28-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Use of sliding scale pain protocols is superior to traditional prescribing for acute pain management

Primary Author:

Christian Gill, Kent Hospital

Additional Author(s):

Michael Facente

Michelle Kelley

Purpose: Six protocols for managing pain for inpatients were developed to better meet the analgesic needs of patients with acutely painful episodes. The protocols take into account patient-specific factors such as opioid tolerance (vs opioid naivety) and enteral status (ie. PO vs NPO). The protocols were also developed in effort to streamline analgesic prescribing, while providing consistent and safe amounts of analgesic medications, and allow for prevention and management of opioid-related adverse effects. The purpose of this study was to evaluate the impact of the implementation of acute pain protocols on pain management efficacy and safety outcomes.

Methods: Patients who were admitted to the hospital and prescribed one of 6 acute pain protocols between 4/30/15 and 7/30/15, were admitted to a hospitalist service, and had received at least 2 doses of 'as needed' analgesic medication within 24 hours were eligible for inclusion in this retrospective chart review study. Patient records were excluded if their stay included a surgical procedure, admission to the intensive care unit, or if they were solely treated in the emergency department. Records were reviewed from the date of initial order for an opioid protocol and followed until discharge or 10 days, whichever occurred sooner. Data collected included: (1) baseline demographics (including reason for admission, indication(s) for presence of pain, total length of stay, and analgesic medication use prior to admission), (2) efficacy measures (baseline and subsequent verbal pain rating scores (0-10) recorded from the eMAR and nursing notes to determine time to achieve analgesia [as defined by $\geq 2/10$ improvement], total opioid use expressed in oral morphine equivalent doses [MEDs]), and (3) safety measures (use of naloxone, incidence of gastrointestinal complications, as evidenced by use of add-on medications). A sample of patients admitted during the same time frame and

2016 Summer Meetings Poster Abstracts

meeting other inclusion/exclusion criteria, yet not prescribed one of the acute pain protocols served as a control group for comparisons. The study protocol was approved by the institution's IRB.

Results: Twenty-six patients met study criteria and were included in the analysis (protocol group), in addition to 26 from a random sample of patients who received traditional pain management approaches. The average baseline pain scores were similar between groups (7.19 in protocol, 7.27 in control, $p=0.89$). Patients in the protocol group required significantly less time to achieve meaningful analgesia (an average of 452 minutes \pm 100.4, median 261), compared the control group (917 minutes \pm 202.4, median 609, $p=0.047$). Patients using an opioid protocol used an average of 31.5 (\pm 6.5) MEDs per day compared to 63.4 (\pm 9.5) MEDs in the control group ($p=0.008$). The use of non-opioids was not significantly different between the 2 groups ($p=0.81$). A similar number of patients in each group experienced nausea/vomiting (10 in protocol vs 12 in control, $p=0.390$), however, those in the control group required significantly more doses of antiemetic medications ($p=0.041$). Patients in the protocol group received standing bowel regimens, while those in the control did not, however, 6 patients in the control group required orders for medications to treat constipation. Incidence of diarrhea was not significantly different between groups ($p=0.183$) and no patients required the use of naloxone in either group.

Conclusion: Findings from this preliminary analysis of the implementation of acute pain management protocols indicate that the use of standardized approaches to pain management that include opioids, non-opioids, and medications to prevent opioid-related adverse events is more effective than traditional approaches to prescribing of analgesics. A continuation of this work utilizing a larger sample size will help identify if such an approach is also associated with reduction of opioid-related adverse drug events.

2016 Summer Meetings Poster Abstracts

Submission Category: Pain Management/Palliative Care

Session-Board Number: 29-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Designing an intervention: recipe for standardized order sets for inpatient pain management

Primary Author:

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Additional Author(s):

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Linda Blanton

Shiney Karikottu

Purpose: While pain management is an integral part of the practice of medicine, optimal management in the inpatient setting remains elusive. Barriers to optimization include ineffective communication between patient and staff, insufficient knowledge of pain treatment, failure to assess or re-assess pain appropriately and lack of pain management guidelines. At our institution, a multidisciplinary work group of physicians, nurse practitioners, nurses and pharmacists designed a comprehensive pain management program that is comprised of tools that optimize communication between patient and staff, education for prescribers, nurses and patients/ patients' family and standardized pain management order sets.

Methods: A thorough assessment of available pain management order sets found many inconsistencies with medication regimens and monitoring parameters, therefore the workgroup decided to streamline them. We started by outlining the essential elements that must be included in a comprehensive pain management order set. We identified two general populations of patients that require individualized dosing of opioid medication: opioid naïve and opioid tolerant. For each population, two types of order sets were needed, one for general pain management and one for patient controlled analgesia. . Using this methodology, six different order sets were created. The general pain orders contain options for mild, moderate and severe pain. Consistent morphine milligram equivalent (MME)/day were calculated across opioid analgesic types and administration routes for each level of pain with a graded increase based on severity. Naturally, the recommended IV PCA starting doses are lower for opioid naïve patients compared to starting doses for opioid tolerant patients. Safe dosing of opioids was a priority, so safety parameters were embedded in the order sets including the routine use of the

2016 Summer Meetings Poster Abstracts

Pasero Opioid Induced Sedation Scale (POSS) in assessment of the patient prior to administration of opioid. The six order sets were presented to various committees and physician groups for feedback and their recommendations were incorporated when possible. The hospital's Guidelines for Safe Pain Management was also updated.

Results: Six different order sets were created for pain management in the adult population. Recommendations for dose adjustments for renal/liver impairment, and age were included for each medication where applicable. Only one oral and one injectable option may be selected for each pain range (i.e., mild, moderate or severe pain), with guidance for when to use the IV over the oral option. Medications and guidance for management of adverse effects to opioids as well as orders for monitoring (eg, POSS), assessments and documentation were also incorporated. The general pain management orders for opioid tolerant patients contains directions for the prescriber to continue the home opioid regimen and consider increasing the MME/day by up to 30% as a standing dose and/or to add additional dosing for breakthrough pain that is up to 20% MME/day of the total opioid dose utilized in the previous 24 hours. The Guidelines for Safe Pain Management were designed to guide the user through the process of pain management including, but not limited to: identifying comorbid conditions that may place patients at increased risk for respiratory depression (eg sleep apnea), identification of opioid tolerant patients, appropriate dose adjustments if indicated, and conversion from PCA to oral opioids.

Conclusion: The order sets were approved by the Pharmacy and Therapeutics Committee and is available in paper form pending availability in the CPOE system. The Guidelines for Safe Pain Management is available on the hospital's intranet site.

2016 Summer Meetings Poster Abstracts

Submission Category: Pain Management/Palliative Care

Session-Board Number: 30-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Implementation of an acute pain service at the Alaska Native Medical Center

Primary Author:

Ashley Schaber, Alaska Native Medical Center

Additional Author(s):

Aimee Young

Purpose: Implement a multidisciplinary Inpatient Pain Service team consisting of a midlevel provider, pharmacist, and a registered nurse with the goals of reducing the use of opioids, improving post-operative pain control, increasing patient safety, and improving patient satisfaction scores regarding inpatient pain relief.

Methods: In July 2014 a gap analysis was performed on opioid adverse drug event prevention prior to proposing project to hospital administration and it was used to identify areas for improvement on inpatient pain management. Shortly thereafter a plan was developed to include funding and justification needed to implement an inpatient pain service. The proposal was submitted to hospital administration to request "Strategic Initiative" funds for implementation of a multidisciplinary acute pain management team. Hospital administration enthusiastically approved request. In September 2014 a pharmacist was selected for the Inpatient Pain Pharmacist position. The pharmacist obtained additional training through ASHP Pain & Palliative Care Traineeship Levels 1&2. In October 2014 the midlevel provider was hired and the Inpatient Pain Service began advertising service and consulting on inpatients by November 2014 with one hour per day of dedicated midlevel provider time. The pain pharmacist became available on the surgery floor for nursing and provider staff to answer questions and discuss pain management for specific patients. Shortly after the pain service began, the service updated hospital policies and procedures to standardize pain management. The service also provided education to hospital staff regarding acute pain control as well as the inpatient pain service. In January 2015 a consult function was made available to providers to request the pain service for their patients, and education sessions were offered to staff.

Results: From November 2014 until July 2015, the Inpatient Pain Service received 99 consults totaling 213 provider/patient encounters. There were 668 pharmacist interventions and 129

2016 Summer Meetings Poster Abstracts

pharmacist encounters. Over 120 nursing, pharmacy, and provider staff were educated regarding clinical pearls of pain management, as well as the function and goals of the inpatient pain service. The Inpatient Pain Pharmacist prevented an average of 5 drug related events daily. Educational interventions created included an opioid conversion chart and presentations on epidurals, low dose ketamine infusions, and opioid withdrawal. The service established a Pain Resource Nurse training packet which includes 12 hours of nursing education on pain as well as a consult function for the service in the electronic health record. The service also facilitated the update of electronic order sets related to pain, including the creation of a ketamine order set, and a complete overhaul of the non-L&D epidural order set.

Conclusion: The Inpatient Pain Service was successfully implemented and well received by patients and providers. To maintain long term positive results, additional staff will need to be hired, and ongoing provider/nurse training should take place

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 31-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Patient-level medication regimen complexity in bipolar disorder

Primary Author:

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Additional Author(s):

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Patrick Hosokawa

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Purpose: The recommended pharmacologic agents used for the treatment of bipolar disorder have drastically increased and have become progressively more complex. There have been additional pharmacologic treatments approved by the FDA as well as FDA off-labeled guideline recommended therapies added to the armamentarium. To effectively control the episodic symptoms, prevent relapse, hospitalization, and minimize morbidity associated with bipolar disorder, polypharmacy has become remarkably common and is now the rule rather than the exception. The increasingly complex medication regimens can negatively impact adherence and adversely influence pharmacologic efficacy.

Methods: This was a cross-sectional, retrospective study using existing medical record data to investigate the patient level Medication Regimen Complexity Index (pMRCI) for bipolar disorder. The prevalence cohort was comprised of ambulatory, adult patients ranging from 18-88 years of age diagnosed with bipolar disorder. Patients included in the cohort received care at the University of Colorado Anschutz Medical Campus (CU-AMC) University Hospital ambulatory clinics and must have had one index visit between July 1 and December 31, 2012 and at least one additional clinic visit in the year 2012 to qualify as a patient receiving active care. Additionally, each patient needed a bipolar disorder diagnostic code (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]) of 296.0x, 296.4 – 296.66, 296.7, 296.8x, or 296.89 and at least one active bipolar mood stabilizing medication identified by National Drug Code (NDC). Each medication in the patient's electronic medication list was assigned to one of three medication categories: 1) bipolar mood stabilizing medications, 2) bipolar adjunctive medications, and 3) other medications.

2016 Summer Meetings Poster Abstracts

Results: The average for total patient-level medication count was 6.7 (range 1-22); 48.0 percent of patients are on 5 or fewer unique medications, 36.0 percent of patients are on 6-10 medications, and 16.0 percent of patients are on 11 or more medications. The average pMRCI for the bipolar patient sample was 17.78 (range 3-57.5). The defined bipolar adjunctive-treatment and bipolar mood stabilizing Medication Regimen Complexity Index (MRCI) average was 6.77 (range 2-21) and contributed to 38.1 percent of the total pMRCI despite an average medication count of 2.65 (range from 1-10). All other (non-bipolar) medications comprised the two-thirds balance of MRCI (61.9 percent). For bipolar patients, 60 percent of the MRCI was associated with dosing frequencies and 35 percent of patients had 3 or more unique dosing frequencies. The most frequent direction was to take the medication at a specified time (42 percent), and almost 30 percent of patients had 3 or more recorded instances of additional usage directions.

Conclusion: The higher pMRCI compared to the average total medication counts demonstrate that the pMRCI scores have higher descriptive value beyond a simple medication count. Medication dosing frequency greatly added to the total pMRCI score. Two key features that largely influence pMRCI were identified; the first was medication frequency and the second was the concurrent use of other medications. Clinicians can potentially improve patient adherence by assessing ways to decrease daily dosing frequency and review the need for other prescription and non-prescription medications.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 32-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Estimating the economic impact of reduced total surgery time: an analysis to evaluate potential operating room cost savings with a novel polyaldehyde-based vascular surgical sealant

Primary Author:

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Purpose: The current goals of triple aim in health care are to (1) enhance patient experience, (2) reduce healthcare expenditures, and (3) improve population health. In this context, the objective for this analysis was conducted to estimate the potential economic impact of shorter total surgery time with polyaldehyde-based vascular surgical sealant (PBS) as the outcome of interest.

Methods: Data from a prospective, multicenter, randomized, controlled study of prophylactic sealing of suture lines at the anastomosis between native vessels and synthetic vascular grafts or patches, comparing the PBS sealant (containing equal volumes of purified bovine serum albumin and polyaldehyde; PreveLeak) versus a commonly used topical agent, absorbable gelatin sponge (AGS, containing 125 units/mL human derived thrombin) showed a clinically meaningful and statistically significant difference of -0.6hr, equivalent to 36 minutes shorter total surgery time [3.2 ± 1.4 hr (N=110) for PBS sealant versus 3.8 ± 2.2 hr (N=106) for AGS, (95% CI: -1.2 to -0.2, P=0.0085)] in a broad array of vascular procedures including aortic, extremity bypass, carotid, hemodialysis access grafting, and other vascular surgical procedures.

Results: While no formal data on actual OR costs at the facility level by HCUP or AHA were published, OR time costing between \$20-\$65/minute was reported by OR Manager Inc. In contrast, a 2005 study of ~100 US hospitals found that OR charges to patients averaged around \$62/minute (range: \$22-\$133/minute), depending on a variety of factors including the region of US and surgical procedure based on complexity level (1-6) being performed, as, for example, OR time for major cardiac surgery costs more than that for an inguinal hernia repair. Other Google

2016 Summer Meetings Poster Abstracts

searches identified some online postings of OR charges. At Akron General a 532-bed hospital with a complexity level-1 case is billed at \$28/minute whereas a complexity level-6 case is billed at \$63/minute. University Hospitals Case Medical Center with 1032 beds with a level-1 case is billed at \$64/minute whereas a level-6 case is billed at \$128/minute. For this analysis, we chose OR costs instead of a wider range of patient's OR charges to estimate a potentially closer actual cost at a surgical facility. From a \$20-\$65/minute cost perspective, a surgical facility could potentially save between \$720-\$2,340 per patient based on 36 minutes shorter total surgical time with PBS.

Conclusion: Compared to AGS, prophylactic sealing of suture lines at the anastomosis with PBS is associated with a potential reduction in OR costs based on this analysis.

2016 Summer Meetings Poster Abstracts

Submission Category: Practice Research/ Outcomes/ Pharmacoeconomics

Session-Board Number: 33-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Real-world treatment patterns and demographic, clinical and economic characteristics of rheumatoid arthritis patients initiating repository corticotropin injection therapy

Primary Author:

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Additional Author(s):

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Purpose: Repository corticotropin injection (RCI; H.P. Acthar Gel) is FDA-approved as adjunct therapy for short term administration in select cases of RA. The purpose of this study was to describe the profile of patients with RA initiating RCI.

Methods: Patients aged greater than or equal to 18 years with greater than or equal to 2 diagnoses for RA between 7/1/2006 and 4/30/2015 were identified from a nationally representative HealthCore Integrated Research Database. Index date was the 1st RCI or the date for 2nd biologic initiated following the 1st RA diagnosis. Pre-index period was the time between the 1st RA diagnosis and the index date where patients were required to be continuously enrolled. Baseline characteristics, actual real-world treatment patterns and per patient per month (PPPM, to account for variable length of follow-up) healthcare costs (allowed paid amount) were assessed using descriptive statistics.

Results: Among 6,190 eligible RA patients (mean age 49, 69% females, and Deyo-Charlson Comorbidity Index [DCI, excluding RA] score 0.9 [SD, 1.5] at index), a total of 180 (3%) patients initiated RCI. RCI patients on average were 60 (SD, 15.7) years old and 56% were females. Most RCI patients were enrolled in a preferred provider organization (90%), 75% were from the Southern US and mean DCI score was 1.1 (SD, 1.4). Mean length of follow-up for RCI patients was 7 months (SD, 15) and 17 months (SD, 20) for the pre- and post-index periods, respectively, during which RCI was filled 4.8 times (SD, 4.6) on average. Most commonly used (top 4)

2016 Summer Meetings Poster Abstracts

medications during the pre-index period were infliximab (61%), corticosteroids (26%), opioids (22%), and rituximab (17%) whereas post-index were infliximab (61%), rituximab (61%), opioids (43%), and intravenous immunoglobulin (33%). RCI patients incurred lower all-cause PPPM medical costs (\$1,881 vs. \$682) in the post-index period as compared to the pre-index period, driven by lower inpatient (\$1,579 vs. \$503), emergency department/other (\$118 vs. \$84), and outpatient (\$184 vs. \$95) costs. However, overall post-index PPPM cost was higher (\$2,751 vs. \$5,487) due to higher pharmacy costs (\$869 vs. \$4,805).

Conclusion: Approximately 3% of eligible RA patients initiated with RCI. RCI patients tended to be older and had more comorbidities than the comparable RA population. Lower healthcare use following the initiation of RCI may suggest potentially better disease control as reflected in lower medical costs. Reductions in medical costs may offset pharmacy costs. Future research exploring impact of RCI on long term outcomes is warranted.

2016 Summer Meetings Poster Abstracts

Submission Category: Psychotherapy/ Neurology

Session-Board Number: 34-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Neuroleptic malignant syndrome due to withdrawal of antiparkinsonian drugs: A case report and review of the literature

Primary Author:

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Additional Author(s):

Rodney Richmond

Purpose: Purpose: Neuroleptic malignant syndrome is an uncommon complication usually seen with the initiation of neuroleptic drugs. A similar presentation, however, is found in some cases of abrupt reduction or withdrawal of levodopa in the treatment of Parkinson's disease. We report a case of neuroleptic malignant syndrome that occurred following both an abrupt discontinuation of entacapone and abrupt dose reduction of carbidopa/levodopa due to a medication reconciliation error. Further, we present a review of the literature, reporting on similar cases including a summary of causes, attenuating factors, and treatment options.

Methods: An analysis of medical records for the case report and a review of literature was conducted for neuroleptic malignant syndrome presenting in patients with Parkinson's syndrome. Medical records from the nursing home, hospital, and assisted living facility of the patient were analyzed and evaluated for cause, risk factors, and symptoms of neuroleptic malignant syndrome. The comprehensive literature search of PubMed to identify appropriate cases used these search terms: "Levodopa"[Mesh] OR "carbidopa, levodopa drug combination" [Supplementary Concept] AND "Neuroleptic Malignant Syndrome"[Mesh]. Causes, treatment, and outcome of each case were reviewed and evaluated for proper conclusions.

Results: The analysis of the medical records concluded a diagnosis of neuroleptic malignant syndrome due to an abrupt dose reduction of carbidopa/levodopa. Symptoms of this patient included pyrexia despite no signs of infection, rigidity of peripheral muscles, elevated CPK levels, and change in mental status. The patient recovered but had considerable decline in cognitive abilities and increased Parkinson's symptoms. The review of literature included 80 cases of neuroleptic malignant syndrome in Parkinsonian patients, 43 of which were due to withdrawal or reduction of levodopa. One case of neuroleptic malignant syndrome in a patient with cerebral palsy was also included. The review of literature indicated there was a relationship between the development of neuroleptic malignant syndrome and the sudden

2016 Summer Meetings Poster Abstracts

discontinuation or reduction of levodopa. The current conclusion of etiology based on the research is a decrease in dopaminergic stimuli to the basal ganglia and the hypothalamus, and the classic triad of symptoms include hyperpyrexia, muscle rigidity, and rhabdomyolysis. There were also cases found in patients with Parkinson's that had other causes and did not include the discontinuation of antiparkinsonian medications. Furthermore, proper and timely treatment was found to be imperative to prevent further sequelae.

Conclusion: Neuroleptic malignant syndrome is a rare but serious adverse event that can result from abrupt withdrawal or dose reduction of levodopa as well as other antiparkinsonian drugs. Abrupt withdrawal or dosage reductions should be avoided and instead tapered down to a safe dose to lessen the risk of the patient developing this syndrome. It is especially important to recognize causes, risk factors, and symptoms of neuroleptic malignant syndrome so that treatment can be promptly initiated to increase positive treatment outcomes.

Methods:

Results:

Conclusion:

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 35-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Evaluating the role of interprofessional communication in reducing delayed medication administration

Primary Author:

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Additional Author(s):

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William Mabry

Purpose: According to the American Society of Health-System Pharmacists (ASHP), medications administered outside the scheduled administration time are considered a type of medication error. ASHP suggests several factors cause medication errors: 1) inexperienced and inadequately trained staff, 2) poor communication among health-care providers, and 3) lack of effective policies and procedures. A comprehensive literature review determined a lack of published material on the impact of improving communication among health-care providers in pediatric hospitals. The objective of the study was to evaluate the effect of improving communication among nurses and pharmacists on delayed medication administration in a tertiary pediatric hospital.

Methods: After institutional review board approval as an expedited study, the quality improvement project was conducted in two phases. Phase one focused on missing intravenous medications on one pediatric medical/surgical nursing unit. Phase two focused on improving communication on all pediatric medical/surgical nursing units to determine its impact on delayed treatment. For the study, a medication was considered delayed if it was administered greater than one hour after the scheduled time. A communication guide and board between the pharmacy and nursing departments were implemented to communicate the deliveries of medications by pharmacy. Data were collected through retrospective chart audits from a report that identified patients with a delay in treatment due to medication not available (MNA). Data included patients' nursing unit, medication type and name, route of administration, time due, time administered, and type of medication order (stat, new, or routine). Medications were

2016 Summer Meetings Poster Abstracts

categorized as critical or non-critical. Critical medications were antibiotics, antifungals, antivirals, anticoagulants, immunosuppressants, antiepileptics, and vasopressors. An electronic survey was developed using a 5-point Likert scale and a free text question to assess communication between nursing and pharmacy, knowledge of MNA, and understanding of pharmacy medication delivery processes. A link was distributed via email to bedside nurses on pediatric medical/surgical units (n equals 60). The mean for each survey question was determined, while proportional relationships were analyzed for MNA.

Results: Phase one showed a 34 percent reduction in the total number of medications given late on one unit. After three months, phase two demonstrated a 30 percent reduction in delayed treatment due to MNA on all units (p equals 0.009). There was a 29 percent reduction in critical medications administered late during phase two (p equals 0.007). The number of intravenous, oral, and newly ordered medications administered late were reduced by 28 percent (p equals 0.009), 15 percent (p equals 0.51), and 35 percent (p equals 0.001), respectively, during phase two. Alternatively, phase two was ineffective in reducing delayed stat and routine medication administration. Forty-nine bedside nurses responded to the electronic survey. Ninety-two percent reported documenting MNA when the medication could not be located at the scheduled time for administration. Respondents also reported locating medications during scheduled administration 69 percent of the time. Thirty-three percent of respondents believed communication between pharmacy and nursing was underutilized (mean equals 2.69); forty-three percent believed communication about pharmacy delivery times was unsatisfactory (mean equals 2.5).

Conclusion: Enhanced communication among nurses and pharmacists improved on-time administration of medications. The results show improving nurses' awareness of pharmacy medication delivery practices not only improves communication, but it can also decrease delay in medication administration. This study will help pharmacy and nursing departments understand their roles in preventing delayed medication administration within a pediatric hospital.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 36-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: System wide implementation of an epinephrine (1:1000) for anaphylaxis kit

Primary Author:

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Additional Author(s):

John Feucht

Glenn Huth

Kenneth Moss

Brandon Singer

Purpose: A safety initiative was developed by emergency room physicians and pharmacists in response to a near miss event at our institution. Epinephrine (1:1000) for anaphylaxis was almost administered via the intravenous route. An emergency anaphylaxis kit was developed and implemented to prompt clinicians to administer epinephrine (1:1000) intramuscularly in this emergency setting.

Methods: Several components were incorporated into the design of the epinephrine anaphylaxis kit to enhance safety. Specific labeling is provided on the inner and outer surfaces of the kit indicating the appropriate dosing and administration instructions. All necessary supplies to administer the epinephrine via the intramuscular route are self contained in the kit. Kit color, size and contents are standardized. Epinephrine (1:1000) in the emergency department is only accessible via the kit in the automated dispensing cabinets. Additional interventions were instituted to ensure that when epinephrine was needed it would be accessed as the kit. Glass ampules of epinephrine (1:1000) that were previously available in the emergency department were removed from the automated dispensing cabinets. Also, prior to implementation, emergency room and pharmacy leaders across the system were brought together to determine a workflow. This best practice was trialed at the main hospital site then implemented at a sister hospital and three free-standing emergency rooms. The process to obtain the kit from the automated dispensing cabinet is standardized across all sites.

Results: A total of 35 vends for the kit occurred between 9/25/15 and 2/1/16. Chart audits were conducted to evaluate epinephrine dosage and administration routes. Doses administered

2016 Summer Meetings Poster Abstracts

varied between 0.15 mg and 0.5 mg. Routes that were utilized were intramuscular and subcutaneous. A total of 35 doses were ordered and administered via the intramuscular route. Three doses were ordered and administered by the subcutaneous route. Of the 35 kits that were vended three patients received more than one dose of epinephrine. No doses were administered intravenously and no reports have been received of additional near misses.

Conclusion: With the endorsement of senior clinical leadership, this safety initiative has been implemented at all facilities in the system. Each emergency department in the system now has the epinephrine for anaphylaxis kit available in their automated dispensing cabinets. The pharmacy department is providing and preparing the kits. These kits provide the end user with appropriate tools for successful intramuscular administration of epinephrine for treatment of anaphylaxis. Preliminary data does suggest enhanced safety due to this measure. Monitoring will continue to assure appropriate administration and dosing.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 37-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Comparative study of prescribing errors between medical ward and medical intensive care unit (ICU) at Al Wakra hospital in Qatar

Primary Author:

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Additional Author(s):

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Mohamad Saad

Ahmad Hammouda

Purpose: This study investigated and evaluates the incident rates, types, and severity of prescribing errors in medical units and medical critical care unit in Al-Wakra hospital, to improve medication safety via detecting the type of prescribing errors and potential reasons for such errors. Secondary outcome of the study was to evaluate most common types of errors, rate of acceptance to correct the errors by the physicians, most common physician specialty making prescribing errors, most common medication or class of medications related to errors, the shift related to high rate of errors and the role of the pharmacist in decreasing prescribing errors.

Methods: This study was designed as an audit retrospective quantitative study. Data about medications was collected from all prescriptions which have been written to the patients who were admitted to Al wakra hospital's medical unit ,and medical ICU from November /2014 to April /2015 from the hospital's CIS (Clinical information system) and PMS (pharmacy management system) computer systems on daily basis. Then data about all error reports (OVA) which reported during the study period were collected from pharmacy quality improvement department through OVA/incident electronic reporting system. These OVAs were reported by the pharmacist who is available on duty and before starting the study they got all required information about reporting of errors. These data were collected from monthly pharmacy quality report sheet.

The excluded errors were reported from outpatient pharmacy during process of discharge of the patients from the areas of the research or errors due to telephone orders mistakes.

Prescribers were unaware of the study in order to avoid changes in behavior.

2016 Summer Meetings Poster Abstracts

Results: A total of (6016) ordered medications by medical ICU with (56) errors (0.9%) and (15658) ordered medications from medical wards with (69) errors (0.4%). The majority of prescribing errors in ICU were related to the dose 21%, dilution 17% and incomplete orders 16% but in medical ward the majority of errors were due to dose 23%, missing data 17% and route administration 13% respectively. It was also found that the rates of prescribing errors in evening shift are significantly higher when compared to morning and night. The percentage of physician acceptance to pharmacy recommendation to correct errors in medical ward by consultants was less than specialist and resident but in the ICU the acceptance of specialists was almost same to consultants.

Conclusion: The prescribing error prevalent rate within medical unit and medical ICU in Al-Wakra hospital was moderate in comparison to other studies and this indicates that there are multiple causes of errors. This highlights the importance of updating local policies, guidelines, tailor educational programs, and routine evaluation of the service to enhance prescribing habits and patients' safety. These findings highlighted the importance of pharmacists and clinical pharmacist in decreasing prescribing errors. and the importance of pharmacy service expansion all over the hospital.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 38-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Contributions of good catch program in a high reliability organization

Primary Author:

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Isha John

Ann Chon

Purpose: We are a 266-bed community hospital with a focus on being a high reliability organization. In the Department of Pharmacy, we instill this within our staff through a robust good catch program that promotes frontline staff to bring suggestions for system changes and improvement to pharmacy leadership. Our program has been in place since July 2010 in the inpatient pharmacy department. Both pharmacists and technicians have contributed consistently to the program. The goal is to empower staff to find failure modes to ultimately contribute towards patient and family centered care.

Methods: Administration of the good catch program is a responsibility of the Medication Safety Manager. The goals of the program are to create a culture of safety and focus on improving the medication-use system, to create a program where all pharmacy staff can be medication safety team members, to increase the frequency of reporting of near-misses, to act as a “suggestion box” for the medication-use system, and to create a system where pharmacy staff feel ownership for the safety of the medication-use system. There is a multi-modal approach to allow staff to submit good catches via phone, email, or on paper left in manager’s mailbox. The latter two submission methods often include screen shots or printouts from our electronic health record (EHR). Staff can submit as many good catches as they identify each month. The Medication Safety Manager works collaboratively with our frontline staff, clinical informatics analysts, nursing administration, clinical education, providers and pharmacy administration to analyze and improve our medication use process based on the good catch submissions. One pharmacy technician and pharmacist are randomly selected from all monthly good catch submissions to be recognized at each monthly staff meeting for their contribution both with a certificate displayed on a departmental bulletin board and a hospital “working on wonderful” (WOW) card which provides a discount at all hospital eateries.

2016 Summer Meetings Poster Abstracts

Results: Reported good catches since implementation have consistently trended upwards for both pharmacists and pharmacy technicians. Our first month of the program in 2010 included 9 submitted good catches. In January 2016 we had 49 good catches submitted. System changes that have resulted from the good catch program have affected all parts of the medication use system at our hospital: electronic health record, storage (includes automated dispensing cabinets, expiration date issues, and drug shortage management), prescribing, transcription/order processing, preparation/dispensing, administration, monitoring and patient factors (such as issues surrounding patient's own medications). Additionally, many good catch reports have resulted in staff education for pharmacy, physician and nursing staff. In a high reliability organization, it is important to be preoccupied with failure to continually improve our systems and processes. The good catch program helps support this initiative.

Conclusion: The good catch program at our community hospital has been beneficial in highlighting error prone processes and encourages staff to bring suggestions and issues to the attention of pharmacy management. The good catch program promotes staff engagement as staff feel their opinions count toward optimizing departmental systems and processes. Additionally, the good catch program encourages staff within our department to adopt the attributes of a high reliability organization (sensitivity to operations, reluctance to simplify, preoccupation with failure, deference to expertise and resilience).

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 39-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Evaluating smart pump library to improve safety of intravenous high-risk medications

Primary Author:

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Additional Author(s):

Katayoon Ghomeshi

Allison Pollock

Michelle Deng

Andrea Robertson

Purpose: To evaluate the use of smart infusion pump alerts for IV high-risk medications and to identify opportunities to enhance safe use of the current system

To determine safe but not overly restrictive limits of IV high-risk medications to minimize “noise” alerts

Methods: In this descriptive study, data collected from Guardrails® and Alaris® System includes all IV infusions (bolus, intermittent and continuous) and alert data for adult patients at UCSF Medical Center during June 2015. Data provided by Guardrails® and Alaris® does not include patient identifiers. A report from Epic (electronic health record) for the same time period will be used to estimate the number of ordered/administered high-risk medications per patient and per patient-visit. All records from Epic that include patient identifiers will be de-identified and encrypted. UCSF Institutional Review Board has approved this study.

The analysis of this data will help evaluate if clinicians are using the pump correctly. To assess clinician use, the following variables will be analyzed: (1) compliance rate of utilizing the drug library, (2) number of alerts per high-risk medication infusion; (3) override-to-alert ratio per medication; (4) clinician response to the alert, as indicated by percentage of overrides versus cancels versus reprogramming of the pump. To assess the drug library, the following data will be analyzed: (1) frequency of “good catch,” as defined by Carefusion [decimal point errors, zero/decimal point errors, rate/dose errors, double digit errors, high rate errors]; (2) pump-

2016 Summer Meetings Poster Abstracts

programming averted errors per alert by drug, by infusion type, by time of day; (3) rate of potential nuisance (noise) alerts; (4) rate of averted errors/adverse drug events (ADEs).

Results: Preliminary results shows that out of 2,534 alerts, 1,954 (77%) were overridden, 498 (20%) cancelled, and 82 (3%) were reprogrammed to drug library settings. Override action was done within 2 seconds (noise alert) in 772 (40%) of all overridden alerts. The top five overridden medications in descending order are: fentanyl, heparin, phenylephrine, magnesium sulfate, and hydromorphone.

Conclusion: Preliminary results indicate that there are potential areas for improvement with current infusion library.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 40-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Innovative use of an IV workflow system for chemotherapy verification

Primary Author:

Stephen Speth, Indiana University Health Bloomington Hospital

Additional Author(s):

Gregory Fitch

Purpose: In late 2015 pharmacists at Indiana University Health Bedford Hospital began verifying chemotherapy dose preparation using the DoseEdge™ IV Workflow System. Due to networking issues, the purchased workstation was not able to be connected to the IU Health system-wide server, thereby preventing use of the barcode scanning component. However, there was a strong interest in implementing the volumetric verification component. The pharmacist uses the images captured by the technician during compounding to verify doses without the need to gown up and enter the IV room. This innovative use of DoseEdge™ has improved accuracy and efficiency of pharmacist verification.

Methods: A touchscreen workstation was installed in the IV room on a mobile cart next to the chemo hood to process chemotherapy doses. This unit operates as another workstation on the regional center's (IU Health Bloomington Hospital) Internet Protocol (IP) address. The regional center has been using the full DoseEdge™ system since 2011. The DoseEdge™ website with Prizm viewer was installed on 2 workstation PCs in the main pharmacy to allow for remote pharmacist verification.

Most IV workflow systems, including DoseEdge™, allow the user to prepare non-patient specific stock doses ahead of time or as needed. A custom stock product and custom NDC called 'Bedford Chemo' were created to allow for image capture and dose verification without scanning an actual drug NDC barcode. Standard work was developed instructing the technician to capture images of diluent, drug vial, drug in syringe and IV bag with patient label attached. To verify a dose the pharmacist first compares the patient, drug and dose on picture of patient label with the chemo order and worksheet. Next they compare the drug, dose, diluent and IV fluid in picture with patient label

2016 Summer Meetings Poster Abstracts

Results: In the five months prior to installing DoseEdge™ four errors involving chemotherapy were reported. Three of these errors were wrong dose and attributed to faulty pharmacist verification. These errors may be due to shortcuts developed to save time from gowning and entering the IV room to verify doses. No errors have been reported since pharmacists began verifying doses using the captured images.

On average it took nearly 5 minutes for the pharmacist to gown up and to inspect completed doses inside the IV room. Pharmacist verification time was reduced to less than 30 seconds using the images captured by the IV Workflow System, resulting in faster turnaround time and less impact on pharmacist workflow.

Conclusion: IV Workflow Systems combine barcode scanning and image capture to help ensure safety and efficiency of sterile compounding. Barcode scanning intercepts errors before mixing and ideally should be used in conjunction with image capture. However, there may be circumstances that prevent the implementation of the barcode scanning component. Our experience has shown that utilizing only the visual verification component of DoseEdge™ can improve accuracy and efficiency of chemotherapy dose verification.

2016 Summer Meetings Poster Abstracts

Submission Category: Quality Assurance/ Medication Safety

Session-Board Number: 41-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Inter-rater reliability for classification of medication related events

Primary Author:

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Additional Author(s):

Chris Patty

Jennae Goodrich

Purpose: California hospitals are required by state law to have a plan to eliminate or substantially reduce medication-related errors. This plan is called the Medication Error Reduction Plan (MERP). The effectiveness of a hospital's MERP depends, in part, on the ability to accurately and reliably classify medication-related events over time. The purpose of this study is to determine the degree of reliability between hospital staff members whose duties include classification of adverse drug events. A registered nurse (RN), registered pharmacist (RPh) and data analyst (DA) voluntarily participated in this study after IRB approval.

Methods: From a database of Adverse Drug Event reports submitted by hospital staff from December 1, 2014 to February 28, 2015, 100 events were randomly selected by an administrative assistant. Protected health information was redacted from these events and the events were distributed to the RN, RPh and DA who independently classified them according to California MERP and NCC-MERP criteria. A total of 96 events were analyzed due to missing data. A simple percentage agreement value was calculated by dividing classification agreements by opportunities to agree for all combinations of raters.

Results: Overall inter-rater reliability was low with a maximum subscale agreement of 0.064 (CA MERP RN+DA) and overall agreement of 0.218. On average, the best overall agreement between raters was observed in the RPh + DA pair (0.364) and the worst overall agreement between raters was observed in the RN + DA pair (0.322). The RN + RPh overall agreement was measured at 0.343. Only five of 96 (5.2%) of events demonstrated 100% agreement among the three (RN +RPh +DA) raters. Five events had zero CA MERP inter-rater reliability and five had zero NCC-MERP inter-rater reliability in overall classification.

2016 Summer Meetings Poster Abstracts

Conclusion: Using current taxonomies, complete agreement between raters is possible only when the event description is very clear with respect to the process phase in which it occurred and the effect (or lack thereof) on the patient. Revision and simplification of the California MERP categories may improve inter-rater reliability. It is suggested that a nationally recognized taxonomy such as the ISMP's "Key Elements of the Medication Use System" be considered when revising the California MERP definitions. Use of predefined reporting criteria with structured data elements may improve the reliability of event classification by reducing variation in reported event descriptions.

2016 Summer Meetings Poster Abstracts

Submission Category: Pain Management

Session-Board Number: 42-T

Tuesday, June 14, 12:15 p.m. - 1:30 p.m.

Poster Title: Comparing the outcomes of high-risk chronic opioid users enrolled in an Integrated Pain Service versus usual care

Primary Author:

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Additional Author(s):

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Sarah Billups

Purpose: The Integrated Pain Service (IPS) provides cognitive behavioral services, physical therapy, and medication management to patients identified as being at high risk for opioid overdose. The primary objective of the study is to evaluate the impact of the IPS on patients' mean daily opioid dose measured at baseline, 3 months, and 6 months after index date compared to usual care.

Methods: This is a cohort study, with prospective and retrospective components. Eligible patients have chronic non-cancer pain, are bonded with primary care providers at Kaiser Permanente Colorado (KPCO) clinics in the Denver/Boulder area, and are categorized as high risk for overdose according to KPCO Chronic Opioid Therapy Guidelines. Exclusion criteria include: patients referred to the IPS from the neurosurgery or anesthesia pain service, pregnant women, age less than 18, patients without continuous KPCO membership for at least 6 months after index date, non-English speakers, and terminally ill patients. The IPS cohort consists of patients identified as eligible for IPS services who are bonded to a physician at an IPS-eligible clinic, regardless of whether they were ultimately enrolled in the IPS. The Usual Care cohort consists of eligible patients who are bonded to a physician at a non-IPS-eligible clinic. We defined our alpha level as 0.05, used chi square for categorical data, and Wilcoxon two sample test for non-normally distributed continuous variables and ordinal data. Linear and logistic regression was used to control for any confounding. Our study had 80 percent power to detect a 10mg MED difference between cohorts.

2016 Summer Meetings Poster Abstracts

Results: There were 3913 Usual Care patients and 1622 IPS patients identified in each cohort. The IPS population had a higher proportion of patients with the following disease states compared to the Usual Care population: psychiatric disorders, diabetes, and hypothyroidism. At baseline there was no statistically significant difference in median daily oral MED dose between the IPS and Usual Care cohorts (38.3mg, 38mg respectively, P equals 0.922). Baseline healthcare utilization showed that the IPS cohort was more likely to utilize the emergency department (ED) compared to the Usual Care cohort (11 percent, 9 percent respectively, P equals 0.047) and E-mail communication (45 percent, 42 percent respectively, P equals 0.018), while the Usual Care cohort was more likely to utilize outpatient encounters (77 percent, 70 percent respectively, P less than 0.001). The IPS cohort had higher mean total scores on the Pain Catastrophizing Scale and the Current Opioid Misuse Measure questionnaires compared to the Usual Care cohort at baseline (25.34, 21.94 respectively, P equals 0.039) and (11.63, 7.86 respectively, P less than 0.001). At 3 months from baseline, both the IPS and Usual Care cohort had a negative mean difference in mean daily oral MED (-2.89mg; SD 81.3mg, -1.15mg; SD 69.5mg respectively, P equals 0.448).

Conclusion: While both cohorts showed a decrease in mean daily oral MED from baseline to 3 months, the difference between the two cohorts was not statistically significant.