The American Heart Association (AHA) Guidelines for treatment of methicillin-susceptible Staphylococcus aureus (MSSA) infective endocarditis (IE) recommend an antistaphylococcal penicillin (oxacillin or nafcillin) as preferred therapy for both native and prosthetic valves. Cefazolin may be substituted for patients with a non-anaphylactoid penicillin allergy per these guidelines. Although ceftriaxone has been increasingly used in clinical practice in our institution due to its tolerability and convenience compared to antistaphylococcal penicillins, the AHA guidelines do not endorse the agent as a treatment choice. Unfortunately, data comparing cefazolin, ceftriaxone, and antistaphylococcal penicillins for MSSA IE are limited.

The objective of this study is to evaluate the comparative effectiveness and safety of ceftriaxone, cefazolin, and oxacillin for MSSA endocarditis. Secondary objectives include comparing tolerability of each agent, reasons for treatment modification, and outpatient all-cause mortality.

A retrospective chart review will include adult patients who received cefazolin, oxacillin, or ceftriaxone for definitive therapy of MSSA endocarditis and followed up at the Washington University Infectious Diseases Division outpatient clinic. Exclusion criteria include treatment with antibiotics known to be clinically viable for MSSA for more than 72 hours after start of definitive therapy. The primary outcome is treatment response, which is a composite endpoint of microbiological success without objective indicators of clinical failure. Descriptive statistics will be utilized. To compare groups for continuous and dichotomous variables, one-way ANOVA and chi-square analyses will be conducted, respectively.

The results will validate the study institution’s use of oxacillin, cefazolin, and ceftriaxone for MSSA IE and add to the current literature.

Learning Objective:
1.) Evaluate ceftriaxone for treatment of MSSA infective endocarditis as compared to cefazolin or oxacillin

Self Assessment Question:
1.) A potential advantage of ceftriaxone compared to cefazolin or oxacillin for MSSA infective endocarditis is:
   a. Better tolerated
   b. Supported by the AHA guidelines for MSSA infective endocarditis
   c. Safe for patients with a history of anaphylaxis to penicillins
   d. Administered three times per week after intermittent hemodialysis

Q1 Answer: A
RISK BENEFIT ANALYSIS OF EMPIRIC ANTIBIOTICS FOR GRAM NEGATIVE BLOOD STREAM INFECTIONS IN BETA-LACTAM ALLERGIC PATIENTS. Prasanna Narayanan1, Meghan Jeffres2, Garrett Schramm1, Jerrica Shuster1, Mayo Clinic Hospital – Rochester, 200 First Street SW, Rochester, MN 55905, 2 Roseman University of Health Sciences, Las Vegas, NV, 1Barnes-Jewish Hospital, St. Louis, MO. narayanan.prasanna@mayo.edu

Penicillin or beta lactam (BL) allergy is the most common drug allergy reported in North America. Despite potential for a hypersensitivity reaction, clinicians are compelled to choose between prescribing a BL or, alternatively, a non-beta lactam (NBL) antibiotic for empiric treatment of gram negative bacilli bloodstream infections (GNB BSI). Data regarding cross-reactivity in patients with a BL allergy is inconclusive and often contradictory. Furthermore, without sufficient evidence or guidelines to support the use of NBL antibiotics in GNB BSI, clinicians must weigh the risk versus benefit of using a BL antibiotic in a patient with a history of a BL allergy.

The purpose of this multi-center, retrospective, cohort study is to compare the rates of clinical failure and hypersensitivity among patients receiving empiric BL or NBL antibiotic(s). We hypothesize that the rate of clinical failure from use of an NBL will be higher than the rate of an allergic reaction from the use of a BL. This study will evaluate clinical, microbiologic, and laboratory parameters in BL allergic patients with a documented GNB BSI. A total of 197 patients with a GNB BSI and a BL allergy from May 2010 to May 2013 were identified as eligible for study enrollment. Application of exclusion criteria has yielded 132 patients for potential inclusion in analysis. Chi-square and relative risk will be calculated to compare the two groups. Findings from this study may be used to further delineate BL avoidance in patients with a history of a BL allergy.

Learning objective:
1) Describe the clinical dilemma that exists in treatment of BL allergic patients with a GNB BSI

Self Assessment Question:
1) Which of the following statements is most correct?
A. Cross-reactivity rates among beta-lactam antibiotics are well-established
B. Limited evidence exists to support utilization of non-beta lactams in gram negative bacilli bloodstream infections
C. Delayed antibiotic administration has not been correlated with increased mortality in patients with severe sepsis
D. Fluoroquinolones or aminoglycosides are reliable antibiotics for the treatment of gram negative bacilli bloodstream infections

Q1 Answer: B

IMPACT OF RAPID RESPIRATORY PATHOGEN MULTIPLEX PCR TESTING AT A TERTIARY CARE CENTER. Patrick McDaneld, Katherine Perez, Patricia Cernoch, William Musick, Houston Methodist Hospital, 6565 Fannin St., DB1-09, Department of Pharmacy, Houston, TX 77030, patrick.mcdaneld@houstonmethodist.org

Rapid and timely diagnosis or exclusion of viral respiratory pathogens is critical for determining optimal treatment of respiratory infections. However, the methodologies employed in many laboratories have significant limitations. Rapid antigen tests (RAG) lack sensitivity to completely rule out these infections and indirect immunofluorescence assay (IFA) methodologies require approximately 36-72 hours from sample collection to final results, necessitating clinicians to consider using broad spectrum regimens (bacterial and/or viral) in the interim. Advancements in polymerase chain reaction (PCR) based methodologies have allowed the development of rapid, multi-pathogen diagnostic respiratory virus screening panels (RVP). This technology offers enhanced sensitivity (~90%) and can provide definitive viral pathogen results in a runtime of approximately 60 minutes; however, little data exists documenting the impact of RVPs when employed in routine practice.

Houston Methodist Hospital is a large tertiary care hospital that provides services to diverse adult populations including: bone marrow transplant, cardiovascular surgery, cystic fibrosis, oncology, and solid organ transplant patients. This study is a single-center, retrospective analysis of patients undergoing respiratory virus screening via RAG, IFA and/or RVP.

Hospitalized patients with RAG and/or IFA results (10/2011–5/2012; 10/2012–5/2013) and RAG and/or RVP results (10/2013–5/2014) will be screened for eligibility. The primary outcome measure is time to final result availability for respiratory viruses by RAG, IFA or RVP methods in a “real world” clinical setting. Secondary outcomes to be evaluated include: total days of antiviral therapy, days of antibiotic therapy, total hospital cost and inpatient length of stay.

This study is currently ongoing.

Learning objective:
1.) Compare and contrast the available laboratory methodologies for viral respiratory pathogen identification

Self-Assessment Question:
1.) Of the available viral respiratory pathogen detection methodologies, which is paired with its primary limitation?
A. Influenza rapid antigen – Test cost
B. Respiratory syncytial virus (RSV) antigen – Test complexity
C. Biofire film array – Test sensitivity
D. Indirect fluorescent antibody (IFA) – Test turnaround time

Q1 Answer: D
Patients in the intensive care unit (ICU) face intense physiologic stress which can lead to gastrointestinal bleeding from stress ulcers. However, overutilization of stress ulcer prophylaxis (SUP) in the ICU is a recognized problem and there are risks associated with SUP therapies, including risk of Clostridium difficile infection which may be more associated with proton pump inhibitors (PPIs) than H2-receptor antagonists (H2RAs). With this risk in mind, Medical ICU (MICU) order sets for new admissions and mechanically ventilated patients at our institution were modified in August 2013, changing preferred SUP from PPIs to H2RAs. This preference change was accompanied by informal education by clinical pharmacists and attending physicians.

The purpose of this study is to assess appropriateness of SUP in our MICU as well as the impact of changing preferred therapy thorough an order set change. This study is a retrospective chart review of adult patients admitted to the MICU who received at least one dose of SUP during the evaluation period. The primary outcome measure will be rate of SUP use with appropriate indication before and after the order set modification. Appropriate indications will be those established in the 1999 “ASHP therapeutic guidelines on stress ulcer prophylaxis”. Results will be used to complete an economic analysis of inappropriate SUP use. The secondary outcome will be incidence of Clostridium difficile infection.

The results of this study may help guide future efforts medication stewardship efforts, including enhanced prescriber education, order set changes in other ICUs, and formulary modifications.

Learning Objectives:
1.) Recognize patients at risk of stress ulcers and indications for stress ulcer prophylaxis.
2.) Evaluate accepted stress ulcer prophylaxis options, including advantages and disadvantages to each Category

Self-Assessment Questions:
1.) Which of the following patients admitted to the intensive care unit is indicated to receive stress ulcer prophylaxis?
   a. 79 year old female in respiratory distress
   b. 24 year old male with altered mental status secondary to cyclobenzaprine overdose
   c. 34 year old female on mechanical ventilation
   d. 56 year old male with neutropenic fever

2.) Which of the following stress ulcer prophylactic therapies is the recommended by “Surviving Sepsis 2013” guidelines for patients at risk of bleeding with severe sepsis or septic shock?
   a. Pantoprazole 40 mg IV q 24 hours
   b. Misoprostol 200 mcg PO every 6 hours
   c. Famotidine 20 mg IV q 12 hours
   d. Sucralfate 1g PO q 6 hours

Q1 Answer: C  Q2 Answer: A

PRELIMINARY ANALYSIS OF ANTICOAGULATION OUTCOMES AFTER IMPLEMENTATION OF THERAPEUTIC UNFRACTIONATED HEPARIN DOSING GUIDELINES IN MORBIDLY OBESE PATIENTS. Ryan Thurm, Jamie Smelser, The University of Iowa Hospitals and Clinics, Iowa City, IA 52242 ryan-thurm@uiowa.edu

Differences in obese patients’ blood volumes lead to different pharmacodynamic effects of heparin, potentially altering the anticoagulant effect. Although studies have shown that obese patients require a higher total dose of UFH to achieve therapeutic anticoagulation, due to the pharmacodynamic changes, these patients need less UFH per kilogram to achieve therapeutic anticoagulation.

A previous institutional analysis indicated that patients who weighed ≥150 kg required UFH infusion rates greater than the initial institutional 1500 units/hour dose cap. These patients required significantly less heparin per kilogram to achieve a first therapeutic aPTT than non-obese patients. Initial UFH dosing recommendations changed for patients who weighed ≥150 kg from 18 to 13 units/kg/hr for venous-thromboembolic (VTE) indications and from 13 to 11 units/kg/hr for non-VTE indications with no dose cap.

This study is a single center retrospective cohort analysis of patients who weigh ≥150 kg treated with therapeutic UFH from April 15, 2013 to present. Inclusion criteria: ≥18 years of age; weigh ≥150 kg; received at least 24 hours of UFH and achieved two consecutive goal aPTTs. The co-primary outcomes are time to first therapeutic aPTT and infusion rate at time of first therapeutic aPTT. Secondary outcomes are rate at which the new recommendation is followed and number of dose adjustments necessary before therapeutic anticoagulation. A separate analysis will compare anticoagulation outcomes of patients treated with the new dosing recommendations to those who were not. IRB approval was obtained. Data collection is ongoing and interim results will be presented.

Learning Objective
- Attendees should be able to explain the reasons why UFH dosing in obese patients vary and recall the general change in dosing required for therapeutic anticoagulation.

Self Assessment Question
In general, which of the following describes the change in UFH dosing in obese patients in regards to the dose (specified in units/kg) of UFH to reach therapeutic anticoagulation?
   a) More UFH (in units/kg).
   b) Less UFH (in units/kg).
   c) The same amount of UFH (in units/kg).
   d) You shouldn’t use UFH in obese patients.

Answer: b
Cardiovascular Disease continues to be a leading cause of death in adults in the United States and frequently manifests itself in the form of cardiac arrest. Mortality remains high while improvements continue to be made in the recognition and treatment of cardiac arrest both in and out of the hospital. Current guidelines for Advanced Cardiovascular Life Support (ACLS) were published by the American Heart Association in 2010. They emphasize the importance of effective teamwork within the arrest team as a component of the “chain of survival”. Research has indicated that compliance to ACLS guidelines during cardiac arrest is suboptimal. Previous studies have found that hospitals not employing pharmacists on cardiac arrest teams have more adverse drug events in these settings; despite this fact, many hospitals still do not utilize pharmacists on the arrest team.

Current practice at our institution consists primarily of pharmacists not participating on the cardiac arrest team, with the exception of three inpatient units. The Institute for Safe Medication Practices (ISMP) recognizes the importance of reducing errors during cardiac arrests and has provided a stance that ACLS or Pediatric Advanced Life Support (PALS) certified pharmacists should be present on all cardiac arrest teams. This study is a retrospective chart review examining the pharmacotherapy of in-hospital cardiac arrests occurring at our institution between January 1, 2011 and December 31, 2012. Primary outcomes include medication guideline adherence and nonadherence. IRB approval has been obtained, data collection commenced, and preliminary data will be presented.

**Learning Objective:**

1. Identify the most common errors that occur during cardiac arrest response.

**Self-Assessment Question:**

1. Which of the following errors has been reported to occur most frequently during cardiac arrest?
   
   (A) Improper medication  
   (B) Improper dose  
   (C) Delay in medication administration  
   (D) Improper route of administration

**Q1 Answer:** (C) Delay in medication administration

**EVALUATING THE EFFECTS OF Dexmedetomidine On Lorazepam and Haloperidol Use in Patients With Alcohol Withdrawal.** Riley Lizotte, John Kappes, Katie Hayes, Veronica Lesselyoung. Rapid City Regional Hospital, 353 Fairmont Blvd, Rapid City, SD 57701 rizotte@regionalhealth.com.

Patients presenting with severe alcohol withdrawal are often refractory to standard treatments with benzodiazepines, despite escalating doses. The use of sedation in these patients to alleviate alcohol withdrawal symptoms may be necessary to prevent complications associated with increasing use of benzodiazepines.

The objective of our analysis was to evaluate the effects of dexmedetomidine on benzodiazepine and haloperidol dosing in patients with alcohol withdrawal. The effects of dexmedetomidine and propofol on symptom control and subsequent benzodiazepine and haloperidol dosing in patients with alcohol withdrawal were evaluated. Patients were included if they had orders for the alcohol withdrawal protocol and either sedative agent. Patients were excluded if they received a daily maintenance dose of a benzodiazepine or antipsychotic before hospital admission, concurrent use of a continuous infusion benzodiazepine or scheduled antipsychotic dose, concurrent use of dexmedetomidine and propofol, age less than 18, or any contraindications to therapy. Other measures that were evaluated included ICU length of stay, intubation time, analgesic usage, Alcohol Withdrawal Assessment Scale (AWAS), Richmond Agitation and Sedation Scale (RASS), Confusion Assessment Method for the ICU (CAM-ICU), and adverse drug reactions.

In patients with severe alcohol withdrawal that require sedation, dexmedetomidine may be the preferred agent due to adrenergic symptom control, decreased ICU length of stay, and decreased rates of intubation compared to other sedative agents.

**Learning Objectives:**

1. Describe the effects of dexmedetomidine on alcohol withdrawal.
2. Compare and contrast forms of sedation in patients with severe alcohol withdrawal.

**Self-Assessment Questions:**

1. Dexmedetomidine use during alcohol withdrawal has which of the following effects?
   
   a. Decreased adrenergic activity  
   b. Increased adrenergic activity  
   c. Decreased risk of alcohol withdrawal seizures  
   d. Longer ICU stay and intubation times

2. In severe alcohol withdrawal, dexmedetomidine may be an advantageous choice of sedation due to:
   
   a. Decreased risk of alcohol withdrawal seizures  
   b. Decreased duration of alcohol withdrawal  
   c. Decreased intubation and ICU stay times compared to other sedative agents  
   d. Decreased mortality associated with alcohol withdrawal

**Q1 Answer:** A  **Q2 Answer:** C
Patients with uncontrolled postoperative pain can experience lengthened recovery time, increased morbidity and mortality, and decreased satisfaction with care. While over 80 percent of surgical patients experience postoperative pain, certain surgeries are associated with higher intensity pain, including orthopedic and neurosurgeries. The objective of this study is to identify differences in the amount of opioid analgesics used during the perioperative period, the degree of pain control achieved, and the adverse effects experienced between opioid-tolerant and opioid-naïve patients.

Patients admitted for orthopedic and spinal surgeries between October 1, 2012 and October 1, 2013 were identified. Inclusion criteria include patients undergoing total hip arthroplasty, total knee arthroplasty, or spinal surgery. Exclusion criteria include age less than 18 years or inability to report pain. Data collected includes: diagnosis, home pain medication regimen, and quantities of opioids administered prior to and throughout the surgical procedure. All opioids given for 72 hours following surgery are recorded, and total quantities are calculated as intravenous morphine equivalents. Pain scores as charted by nursing are documented for 72 hours post-procedure. Adverse effects documented, the suspected causative medication, and the resulting action taken are also collected. Data collection is currently in progress. Upon completion, statistical analysis will be conducted to determine trends in opioid consumption, pain scores, and adverse effects between the patient groups. Results of this study may be used to optimize postoperative pain control regimens.

Learning Objective:
1) Explain differences in postoperative analgesic requirements between opioid-tolerant and opioid-naïve patients.

Self-Assessment Question:
1) Current literature suggests that the postoperative analgesic requirements of opioid-tolerant patients are __________ compared to their opioid-naïve counterparts.
   A. 10 to 25% less
   B. 30 to 100% less
   C. 30 to 100% greater
   D. 150 to 200% greater

Q1 Answer: C

Comparison of MTM Recommendations Written by Pharmacists With and Without Access to Electronic Health Records in a Rural Healthcare System. Sarah Taylor, Mark Dewey, Lake Region Healthcare, 712 Cascade Street South, Fergus Falls, MN 56538. Sarah.Taylor.1@ndsu.edu

Medication Therapy Management (MTM) involves a pharmacist meeting with a patient for a comprehensive medication review and concludes with the pharmacist writing recommendations to the patient’s healthcare provider(s). Many pharmacists or pharmacies outside of a healthcare system provide MTM services without electronic health record (EHR) access; however, MTM utilizing EHR is starting to expand.

The goal of this research project was to identify how pharmacist access to EHR at Lake Region Healthcare in Fergus Falls, MN, including access to patient laboratory results and clinic/hospital progress notes, would increase clinical recommendations made to providers, such as identifying specific gaps in medication monitoring or medications requiring dose adjustments based on up-to-date laboratory results.

The type/quantity of recommendations made by pharmacists utilizing EHR was analyzed and compared to MTM recommendations made when pharmacists did not have access to EHR. The purpose was to document the benefit that pharmacist access to EHR would have on the type/quantity of MTM recommendations made to providers. Benefits documented by this research could have local and nationwide significance. This model could be an example for other healthcare systems on how to further integrate pharmacists into the healthcare team.

Learning Objectives:
1) Compare and contrast MTM recommendations made by pharmacists with without EHR access.
2) Identify benefits of pharmacist access to EHR on making MTM recommendations.

Self Assessment Questions:
1) MTM incorporating EHR allows pharmacists to review and make recommendations based on:
   A. Patient laboratory results
   B. Patient medication cabinets
   C. Patient clinic/hospital progress notes
   D. Both A and C

2) Benefits of pharmacist access to EHR on making MTM recommendations include:
   A. Improved cost-effective recommendations
   B. Improved patient adherence recommendations
   C. Improved clinical recommendations related to proper medication monitoring and dosing
   D. Improved medication administration recommendations

Q1 Answer: D   Q2 Answer: C
Lake Region Healthcare was one of the recipients of a Minnesota Department of Human Services community services grant, which focuses on helping older Minnesotans stay in their homes as they age. With this grant, Lake Region Healthcare pharmacists are able to provide medication therapy management (MTM) services via tele-health and home visits in Otter Tail and Grant Counties. This service allows older adults in rural areas to receive quality care without having to travel far from home.

The goal of this study is to identify primary care provider satisfaction with this rural, In-Home and Tele-Health MTM program. Through this research, we hope to document that rural providers value the use of MTM and that providers accept recommendations made by pharmacists. Some of the advantages of providing this type of MTM service may include: less physician time spent on medication reconciliation, more time to evaluate a patient’s other healthcare needs/concerns, potential cost savings to both patients and providers. Pharmacists can also help get a better picture of a patient’s full medication routine and identify medications used at home but forgotten on the medication list. Lastly, helpful tips can be applied in real time right in the patient’s home.

Provider surveys will be used to gauge satisfaction and acceptance will be analyzed/quantified based on type of recommendations written and accepted. Follow-up phone calls with patients and provider progress notes will be reviewed to identify if changes were made as a result of pharmacists’ recommendations.

**Learning Objectives**

1) Identify areas for pharmacy to be involved in the health of its rural, aging community.

**Self-Assessment Questions**

**Q1:** Provide an example of the benefits of pharmacist-delivered MTM services prior to a patient’s visit with their primary care provider.

a. Less physician time spent on medication reconciliation.

b. More time to evaluate a patient’s other healthcare needs/concerns.


d. Potential cost savings to both patients and providers.

e. A, B, and D

**Q2:** Provide an example of the advantages for bringing healthcare into the patient’s home.

a. Pharmacists can help get a better picture of a patient’s full medication routine.

b. Helpful tips can be applied in real time right in the patient’s home.

c. Pharmacists can help identify medications used at home, but forgotten on the medication list.

d. Cost-effectiveness of recommendations.

e. A, B, and C

**Learning Objective:**

Identify potential drug therapy problems relating to medications taken by bariatric surgery patients.

**Self-Assessment Question:**

Which of the following are potential drug therapy problems relating to a diabetic patient that had bariatric surgery and was taking glipizide extended-release prior to admission?

A. Safety – potentially unsafe drug for the patient

B. Effectiveness – dosage form is inappropriate

C. Convenience – cannot swallow/administer drug

D. Indication – no medical indication for therapy

E. A, B, and C

**Answer:** E
The 2012 update of the Surviving Sepsis Campaign’s Guidelines for Management of Severe Sepsis and Septic Shock recommends administration of effective antibiotics within the first hour of recognition of septic shock. However, the consensus committee recognizes that despite strong evidence supporting the timely administration of antibiotics, achieving this operationally has been elusive. An international guideline-based performance improvement program was initiated by the Surviving Sepsis Campaign, and the results showed a reduction in hospital mortality rates associated with implementing Campaign recommendations.

Despite convincing evidence that early effective antimicrobial therapy increases survival in a number of disease states, literature describing an approach to achieve effective antibiotic therapy within 60 minutes of sepsis recognition is lacking. A 2012 article published by the Pharmacy Department of a 300 bed hospital reported that in patients admitted to a 9-bed ICU, median time to effective antibiotics was 1.7 hours after onset of septic shock. In the population examined, only 19 of 55 patients (34%) received antibiotics within one hour, with a trend towards less delay in the emergency department (1.1 hours in ED vs. 2.3 hours in the ICU).

Initiation of appropriate antibiotic therapy within 60 minutes is an important quality measure of care for patients with sepsis and septic shock. Thus, after quantifying time to first-dose of antibiotics after order entry and identifying sources of delay within an 800-bed tertiary medical center, we implemented a small-scale, multidisciplinary pilot intervention on two patient care units to improve antibiotic turn-around time for first-dose and stat antibiotics. After a sustained improvement in turnaround time during the pilot, we implemented a modified version of intervention throughout the institution to improve care and outcomes for patients with infectious disease, including sepsis, and hope to show a significant reduction in time to first dose administration.

Learning Objectives:
1.) Identify interventions to improve operational efficiency and contribute to positive patient outcomes.

Self Assessment Questions:
1.) Which of the following interventions is/are effective at improving efficiency and patient outcomes?
   a. Workflow Optimization
   b. Healthcare Provider Education
   c. Technological Interventions/Hard Stops
   d. A and B
   e. A and C

Q1 Answer: E

EVALUATING THE IMPACT AND DEVELOPMENT OF A COMMUNICATION STRATEGY FOR CLINICAL PHARMACISTS ON THE NUMBER OF MEDICATION-RELATED PATIENT FALLS. Sarah Lutz, Samaneh T. Wilkinson, University of Kansas Hospital, 3901 Rainbow Blvd, Kansas City, KS 66160. SLutz@kumc.edu

In October of 2008 the Centers for Medicare and Medicaid Services (CMS) enacted new payment provisions that would reduce reimbursement for select hospital-acquired conditions including patient falls. It has been speculated that medications can play a significant role in patient falls. Currently, the University of Kansas Hospital has a committee that meets weekly to evaluate patient falls that occur. The committee consists of nursing leadership, a physical therapist and a pharmacy resident. Together they determine the cause of each fall and collect data; however this information is not distributed to frontline pharmacy staff.

The purpose of this project is to evaluate a communication strategy to increase the frontline clinical pharmacists’ awareness and provide them with information about medications contributing to patient falls. The number of medication-related falls occurring before and after implementation of this intervention will be evaluated.

The results will be used to determine the utility of this strategy to reduce potentially preventable patient falls. This information will help determine the future role pharmacists will have in fall prevention at the University of Kansas Hospital.

Learning Objectives:
1. Describe the impact of medication-related patient falls.
2. Describe the development and effectiveness of strategy used to report details of medication-related patient falls to clinical pharmacy staff.

Self-Assessment Questions:
1. Medication-related patient falls can have an effect on:
   A. Patient’s length of stay
   B. Cost of patient’s care
   C. Reimbursement from CMS
   D. All of the above

2. The communication strategy used involved the following:
   A. Number of patient falls by division
   B. Medications reported as having a role in patient falls
   C. Patient falls unrelated to medication use
   D. Both A & B

Q1 Answer: D Q2 Answer: D
With an increased focus on 30-day readmission rates in core measures with changes to CMS reimbursement that began in 2013, institutions aim to decrease these rates. Research and literature regarding the importance of a pharmacist’s role has been limited to the inpatient side of patient care and few published studies or reports discuss the impact of a pharmacist in the ambulatory setting on readmission rates. The objective of this study is to compare the 30-day readmissions rates in heart failure patients between those that receive a medication therapy profile evaluation and compliance assessment though meeting with a pharmacist and those patients that do not.

Patients discharged from the University of Kansas Hospital will be observed prospectively from August 2013 to March 2014. Several baseline characteristics will be compared between the two groups to determine if patient populations are similar and to ideally eliminate potential confounders. Patients will be compared at baseline by assessing age, gender, race, as well as disease severity through NYHA Functional Classification and ejection fraction. Follow up will be observed at least until 30 days post discharge for the primary outcome of readmission rates.

Results will be evaluated to determine if groups were similar at baseline and if pharmacists can significantly reduce 30-day readmission rates in heart failure patients. As pharmacists expand their roles and build trust with providers, this topic may significantly validate a pharmacist’s ability in providing quality care and reducing unnecessary healthcare costs.

Learning Objectives:
1) Identify the differences in heart failure readmission rates between groups that meet with an ambulatory pharmacist and those that do not and evaluate whether the significance between the outcomes

Self-Assessment Questions:
1) When seeing patients at the University of Kansas Hospital, ambulatory pharmacists were able to do all of the following except:
   a. Confirm that all disease pertinent medications are started in patients that are able to tolerate
   b. Recommend increases in medications in order to reach target doses from literature evidence
   c. Relieve provider schedules if patients were asymptomatic and no provider assessment was needed
   d. Reeducate patients regarding medications, such as how each medication acts and need for compliance

Q1 Answer: C. Relieve provider schedules if patients were otherwise healthy and no provider assessment was needed

Reduced reimbursement for services plus penalties for lower quality performance have led to hospitals looking for areas to save money and increase efficiency, including labor. The Pharmacy Intensity Score (PIS) and Case Mix Index (CMI) are two metrics commonly used to predict pharmacist workload. However, both are flawed in that they may not predict the real pharmacist workload based on clinical activities.

The purpose of this research is to create a valid workload monitoring tool can be useful in expressing departmental productivity in order to determine a productivity metric that best reflects pharmacist workload at the University of Kansas Hospital. Used appropriately, productivity metrics can help justify pharmacy positions when paired with quality indicators for pharmacy services.

Pharmacists will document the amount of time spent on specified patient activities which will be used to calculate an average time to care for a “typical” patient on a service. This average will be multiplied by the total number of patient days for each pharmacy division: acute care, critical care, pediatrics, and oncology. Time spent on transitions of care activities will also be calculated and added to the time on patient care activities to achieve a total number of hours worked. This will be divided by the number of hours paid to give a simple and reproducible productivity measurement. The tool will be compared to PIS and CMI adjusted patient days for the same time periods in order to determine the most appropriate productivity metric for use at the University of Kansas Hospital.

Learning Objective:
1. Explain the difference between the Pharmacy Intensity Score (PIS) and Case Mix Index (CMI).

Self-Assessment Question:
1. Which of the following statements are correct?
   a. A high PIS denotes that a low number of medication resources were allocated to treat a particular diagnosis related group (DRG).
   b. Two DRGs with an identical CMI may have very different PIS
   c. The CMI is only reflective of pharmacy resources allocated to treat a DRG

Q1 Answer: B
Closed system transfer devices (CSTD) are used to protect individuals from exposure to hazardous medication. In January 2013, the Food and Drug Administration (FDA) created a new ONB code that classifies approved CSTD as a medical device. This classification recognized CSTD as preventing microbial ingress for 168 hours, in addition to safety benefits. This extended sterility gives institutions the opportunity to practice drug vial optimization (DVO), the conservation of medication normally discarded. The application of DVO has been shown to reduce costs and medication waste, but its utility in a community outpatient oncology setting has not been published.

We will investigate the overall cost saving utility of DVO at a community outpatient oncology clinic on five medications, which includes two monoclonal antibodies. Secondary objectives will focus on percent vial conservation and detail the cost associated with using CSTD.

Five medications targeted for DVO are bevacizumab, bortezomib, cyclophosphamide, oxaliplatin, and rituximab. An institution specific report was used to identify these medications with the highest potential for cost savings and waste reduction. The following information will be recorded and tracked over eight weeks to estimate annual impact: expiration date, dose, vials utilized, product code, and order number. Number of vials used and drug recovered will be analyzed to determine the impact of DVO.

Based on retrospective data, we anticipate significant cost savings will occur. The prospective data will show the applicability of DVO as a cost containment strategy in an outpatient oncology setting.

Learning Objectives:
1. Determine the viability of using DVO on select single dose agents as a cost containment strategy at our oncology outpatient clinic.
2. Quantify average percent of a vial conserved through DVO on targeted drug agents.

Self Assessment Question:
1. Using DVO on the five targeted agents had the following financial impact:
   a. No change
   b. An increase in overall cost savings
   c. A decrease in overall cost savings

Self Assessment Answer: b
EVALUATING GUIDELINE ADHERENCE FOR THE MANAGEMENT OF NEUTROPENIC FEVER
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Neutropenic fever (NF) is an oncological emergency that, if not treated promptly, may rapidly progress to bacteremia and death. National NF guidelines have established criteria for empiric antibiotic, antifungal, antiviral, and granulocyte colony stimulating factor (GCSF) treatment. Anecdotal data suggests that treatment at this institution is not consistent with guidelines. The aim of this study is to assess Hematology/Oncology and Emergency Medicine (EM) practitioner familiarity with and adherence to national guidelines, with a focus on vancomycin and GCSF use.

Practitioner familiarity was self-reported using a 7 question anonymous electronic survey. Adherence to guidelines was assessed with a retrospective review of adult patients with chemotherapy-induced NF admitted September 2013 and prior. The primary outcome was the composite of patients treated with vancomycin, filgrastim, and pegfilgrastim consistent with national guidelines.

The survey completion rate was 6/10 (60%) with Hematology/Oncology and 14/26 (58.3%) with EM practitioners. Preliminarily, 22 patients met inclusion criteria in the retrospective review. Empiric treatment was consistent with guidelines in 14/22 (63.6%) patients. Specifically, empiric antibiotics were appropriate in 16/22 (72.7%) patients, with vancomycin addition being the most common reason for inappropriate antibiotic selection. GCSF was administered appropriately in 5/8 (62.5%) patients. Antibiotics were started within 2 hours in 7/22 (31.8%) patients.

There are opportunities to improve empiric vancomycin and GCSF use and reduce time to antibiotic administration in NF patients. Next steps include development of pharmacist-led education sessions for providers and reassessment of familiarity with guidelines.

Learning Objective: Identify which bacteria are covered with guideline-based empiric antibiotic therapy.

Self Assessment Questions: Empiric antibiotics should routinely provide coverage for which of the following types of infections:
   a. Methicillin-resistant Staphylococcus aureus (MRSA)
   b. Candidiasis
   c. Pseudomonas aeruginosa
   d. Both A and C

Q1 Answer: [C]

IMPACT OF PHARMACISTS’ INTERVENTIONS ON ADHERENCE AND ADVERSE EFFECTS IN PATIENTS TAKING ORAL CHEMOTHERAPEUTIC AGENTS. Lisa Narveson, Wendy Brown, Mark Plencner, Jon Schock, and Jeff Wilson, Sanford Medical Center Fargo, 801 Broadway N, Fargo, ND 58122 Lisa.Narveson@sanfordhealth.org

The increasing prevalence of oral chemotherapeutic agents shifts many responsibilities onto patients, including management of often complex medication regimens and monitoring for adverse effects. Quality Oncology Practice Initiative’s (QOPI) Certification Safety Standards address key areas of patient care, including maintaining a plan for assessing and monitoring each patient’s adherence and toxicity with oral chemotherapy.

The objective of this study is to determine if pharmacist involvement through intensive counseling and regular follow-up visits improves medication adherence and decreases the incidence and or severity of adverse effects for patients on oral chemotherapeutic agents.

The study will analyze 21 oral chemotherapeutic agents, filled by adult patients through the oncology infusion center pharmacy, evaluating prescription fill history through medication possession ratio (MPR), as well as incidence and severity of adverse effects. First quarter data from 2013 has been collected and analyzed through chart review. During the first quarter of 2014, these same medications will be analyzed, this time having a pharmacist provide intensive counseling and follow-up visits with patients. Data will be compared to see if increased pharmacist involvement through intensive counseling and regular follow-up visits improves medication adherence and decreases the incidence or severity of adverse effects for patients taking oral chemotherapy.

Learning Objectives:
1.) Describe methods to improve adherence with oral chemotherapeutic agents.
2.) Identify causes for dose adjustments and discontinuation of therapy.

Self Assessment Questions:
1.) Medication possession ratio takes the following into account when assessing adherence:
   A. Length of therapy
   B. Timing of doses
   C. Total days supply of medication
   D. Both A and C

2.) Adverse effects and toxicities can be managed through:
   A. Drug interactions
   B. Supportive therapy
   C. Dose adjustments
   D. Both B and C

Q1 Answer: D  Q2 Answer: D
Learning Objective:
1.) Describe the benefits of pharmacist dosing of warfarin that have been described in the literature.
2.) Examine the differences between pharmacist and physician dosing in total hip and knee arthroplasty patients.

Self Assessment Questions:
1.) The benefits of pharmacist dosing of warfarin supported in the evidence include:
   A. Increased time in therapeutic range
   B. Decreased cost
   C. Decreased time for daily order to be input
   D. Both A and B
2.) Pharmacist dosing of warfarin in total hip and knee arthroplasty patients may result in:
   A. Higher discharge INR and lower use of reversal medications
   B. Lower discharge INR and lower use of reversal medications
   C. Higher discharge INR and higher use of reversal medications
   D. Lower discharge INR and lower use of reversal medications

Q1 Answer: D    Q2 Answer: C
An increasingly strong body of evidence has linked in-hospital hypoglycemia to increased morbidity and mortality as well as increased length of stay and health care costs. This has prompted current guidelines from the American Association of Clinical Endocrinologists and American Diabetes Association to encourage the careful avoidance of hypoglycemia in hospitalized patients.

Identify institutional patterns at Abbott Northwestern Hospital leading to blood glucose values <50 mg/dL and identify strategies for reducing these occurrences. In addition, investigate the benefits and barriers to implementing interdisciplinary huddles around hypoglycemic events.

During a two-month period, interdisciplinary huddles will be conducted for patients experiencing a blood glucose value <50 mg/dL. The huddle will include a root cause analysis intended to formulate a plan to treat and prevent further hypoglycemia. Surveys designed to assess the perceived effectiveness and practicality will be distributed to personnel attending huddles. In addition, patients who have blood glucose values <50 mg/dL over a one-month period prior to implementing the huddles will be identified. Chart reviews will be conducted and data will be analyzed to identify potential strategies for reducing rates of hypoglycemia.

Learning Objective
Identify risk factors predisposing patients to hypoglycemia.

Self Assessment Question
Which of the following are risk factors for development of hypoglycemia?
A. Renal dysfunction
B. Liver dysfunction
C. Use of long-acting insulins such as glargine to manage hyperglycemia related to corticosteroids
D. All of the above

Q Answer: D

Learning Objective:
1) Recognize the influence of obesity on the pharmacokinetics and dosing regimens of medications.

Self-Assessment Question:
1.) Which of the following characteristics of the obese can influence the pharmacokinetics of a drug?
A. Decreased absorption
B. Increased metabolism
C. Increased renal clearance
D. Decreased volume of distribution

Answer: The answer is C. Patients with obesity show an overall increase in volume of distribution and current research is lacking to suggest that obese patients have an overall decreased drug absorption or increased drug metabolism.
QUALITY IMPROVEMENT PROJECT: INTEGRATION OF PHARMACEUTICAL CARE SERVICES FOR NON-CANCEROUS CHRONIC PAIN PATIENTS IN PRIMARY CARE.

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Integration of pharmaceutical care services into primary care is of interest at all levels of healthcare policy1. Assistant Surgeon General RADM Scott Giberson, et al in 2011 put out a call to action with an area of focus on implementation of pharmaceutical care in primary care setting2. The report cites numerous studies that pharmacists integrated in to primary care practice standards have a direct improvement on patient outcomes and is cost-beneficial. The Integration of clinical pharmacists clearly improves the cost and delivery of care3-15. The management of non-cancerous chronic pain management is complex and will benefit from an interdisciplinary approach.

Practicing medical and pharmacy staff members at Firstlight Health System, a rural health system in east-central Minnesota, have identified non-cancerous pain treatment and chronic opioid use as its area to next integrate pharmaceutical care services. Other parts of the country have shown benefit from implementing non-pharmaceutical care validated modalities. The plan at FirstLight is to implement a quality improvement project involving pharmacists providing clinic appointments, therapeutic drug monitoring, community outreach pharmacies, and intensive patient education. The results may lead to a follow up pilot study at FirstLight as a quality of care improvement model. The objectives will be assessed via questionnaire completed by providers partaking in this project and be our measure of success. By utilizing a multidisciplinary team approach in managing non-cancerous pain treatment and chronic opioid use we will be able to develop a strategy to more effectively integrate evidence-based guidelines into current practice.

Learning Objectives:
1. Outline to improve chronic non-cancerous pain standards of care via pharmaceutical care integration.
2. Integrating clinical pharmacists into primary care for chronic pain and remaining cost-beneficial.

Self-Assessment Questions:
1. What is the primary reason for implementing pharmacists into chronic cancerous pain management in primary care? A) enhance patient safety B) therapeutic drug monitoring C) institutional cost-savings D) education of risk vs benefit
2. Which is the greatest barrier to achieving cost-benefit if this were implemented health system wide? A) RPh provider status B) viable cost vs benefit model C) obtaining FTEs to achieve implementation

Q1 Answer: D) education of risk vs benefit
Q2 Answer: B) viable cost vs benefit model

The objective of this project is to analyze the impact of pharmacist input on diabetes management in patients with uncontrolled diabetes in an outpatient setting.

The patients of the Family Medical Care Center (FMCC) are predominantly a low-income population with high rates of comorbid conditions. Providers are increasingly interested in achieving goal hemoglobin A1c (HbA1c) values for the sake of patient care and achieving NCQA quality measures. Intensive follow-up and dose modification of insulin regimens has been demonstrated to produce outcomes of clinical and statistical significance. The intent of this study is to quantify how pharmacy input can assist in achieving these goals. Secondly, this study seeks to identify characteristics of patients who are difficult to manage in hopes of developing strategies to better outcomes among patients who are challenged with motivation, medical literacy, or other barriers.

This study is a retrospective chart review of patients over a period of 6-12 months. For patients assigned pharmacy follow-up, most recent HbA1c values will be recorded at the time of the pharmacy consult. A comparator group of similar patients who are not followed by pharmacy will be selected from medical resident providers. Baseline and follow-up HbA1c values over the 6-12 month period will then be compared. Additional information will be collected regarding those patients not at goal or lost to follow-up, for example comorbid depression, known transportation issues or limited education.

The results and conclusion of this project will help characterize the benefit a clinical pharmacist provides FMCC.

Learning Objectives:
1.) Describe the impact of pharmacy input on patients reaching their diabetes treatment goals.
2.) Identify barriers to patients reaching diabetes goals.

Self Assessment Questions:
1. Question 1 This study found that pharmacists provided a clinically significant contribution to diabetes care:
   A. True
   B. False
2. Question 2 This study found that barriers to patient compliance with diabetes treatment plans include:
   A. Lack of motivation
   B. Drug and/or supply cost
   C. A and B

Q1 Answer: A  Q2 Answer: C

EVALUATION OF PHARMACIST INVOLVEMENT IN OUTPATIENT DIABETES CARE. Ryan Baker, Chelsea Landgraf, Cassie Heffern, CoxHealth 3801 S. National Ave., Springfield, MO 65807. ryan.baker@coxhealth.com
Readmission rate penalties imposed by the Affordable Care Act have forced health systems to improve new methods to decrease healthcare waste and improve transitional care. Heart failure (HF) is the most frequent cause of hospitalization for patients greater than 65 years of age. Data concerning post-discharge management of this disease state have been promising. However, hospital systems with communities that are more well-educated and literate appear to be less likely to benefit from these new services. This indicates that poor health literacy may correlate with increased benefit from services like education and medication reconciliation during transitions of care.

The primary objective of this prospective study is to identify the change in HF knowledge following a standardized pharmacist education intervention at a pilot, interprofessional transitions-of-care clinic within 30 days of their hospital discharge. A secondary objective is to describe associations between health literacy, baseline HF knowledge, HF knowledge following education, demographics, and readmission rate.

The primary objective will be assessed using the “What Do You Know About Heart Failure?” (WDYK-HF) Knowledge Assessment Tool which was developed by the study investigators. This tool was written at a fourth-grade reading level to theoretically optimize patient comprehension of questions. Results will be analyzed using descriptive statistics, and a chi-square analysis will be conducted to compare subgroups.

Outcomes of this study will be used to justify proof of concept for the HF transitions-of-care clinic, help to validate the WDYK-HF assessment, and guide improvements to both the clinic and the WDYK-HF assessment tool.

Learning Objectives:
1.) Describe health literacy and the utility of heart failure knowledge assessment as it relates to self-care.

Self Assessment Questions:
1.) Health literacy is an assessment of a patient’s capacity to:
   A. Read health education material beyond 6th grade reading level
   B. Obtain, process, and understand health information and services
   C. Implement self-care techniques regardless of ability to read
   D. Both A and B

Q1 Answer: B

Q2 Answer: A

Neuropathic pain is responsible for a substantial number of pain clinic visits and a large healthcare expenditure each year. Neuropathic pain may be difficult to manage with goals of therapy including improvement in quality of life including palliation of pain, restoration of sleep, and maintenance of function. Further, neuropathic pain often exhibits a poor response to traditional analgesics. Antiepileptic drugs and antidepressants are commonly used as adjuvants in the treatment of neuropathic pain. Medication adherence is multifactorial; in addition to whether a medication was taken, adherence also depends on if it was administered properly, at the prescribed dose, and at the correct time. Adjuvant neuropathic pain medications include risk factors for non-adherence that may be less common with traditional analogesics. Currently few studies exist on patient adherence to adjuvant neuropathic pain medications in the palliative care setting.

The primary objective of this study is to assess patient adherence rates to adjuvant neuropathic pain medications in palliative care. Secondary objectives include exploring possible associations between adherence, pain score, and quality of life. Demographic, adherence self-recall, and quality of life questionnaires or surveys were used to assess the study objectives. Patients completed these during a regular visit in the palliative care clinic. Additionally, routine pain scores were collected from the visit. Patients who consented to this investigational review board approved study gave permission to obtain pharmacy refill records for adjuvant neuropathic pain medications.

The results of this study will direct future efforts to improve medication adherence in patients with neuropathic pain.

Learning Objectives:
1.) Describe medication adherence and the potential negative effects of non-adherence.
2.) Discuss barriers to adherence and those that effect adjuvant neuropathic pain medications.

Self Assessment Questions:
1.) Medication adherence includes:
   A. A person taking only the inexpensive medications they are prescribed
   B. A person taking more doses of a medication than prescribed
   C. A person taking a medication at the prescribed time
   D. A person taking fewer doses of a medication than prescribed

2.) What is a barrier to adherence for adjuvant neuropathic pain medications?
   A. Side effects that are not well understood by patients
   B. Most are only available through specialty pharmacies
   C. All are available as inexpensive generic medications
   D. All use simple daily dosing regimens without titration

Q1 Answer: C  Q2 Answer: A
EVALUATION OF THE MULTIPLE MINI-INTERVIEW PROCESS AS A PREDICTOR OF ACADEMIC DIFFICULTY IN THE PHARM.D. CURRICULUM. Bryan Bordelon, Seth Heldenbrand, Schwanda Flowers, and Brad Martin, University of Arkansas for Medical Sciences, 4301 W. Markham St., Slot 571, Little Rock, AR 72205 bbordelon@uams.edu

To identify admissions factors prognostic for academic difficulty in the Pharm.D. curriculum to use for admissions determinations and identify at risk students once admitted.

The Multiple-Mini Interview (MMI) process has been utilized since 2008 by the University of Arkansas for Medical Sciences College of Pharmacy (UAMS). Students are scored 1-7 (unsatisfactory–outstanding) during each scenario by our standardized participants. Admissions data from 2008-2012 were evaluated via logistic regression to estimate the influence of potential factors including MMI, GPA, PCAT, age, prior degree, credit hours, and state residence on academic difficulty in our curriculum.

Student's (n=587) had a mean MMI score, GPA, and PCAT of 5.54, 3.56, 71.98, respectively. Students with a MMI score <4.5 MMI (OR=3.02; 95%CI: 1.50-6.09), GPA <3.0 (OR=10.62; 95%CI: 3.55-31.77) and PCAT <45 (OR=6.72; 95%CI: 1.78-25.39) were more likely to experience academic difficulty than those with a MMI score of 5-6, and those with the highest GPA and PCAT scores. Students receiving a Bachelor of Science (OR=1.92; 95%CI: 0.28-0.968) or a graduate degree (OR=4.81; 95%CI: 0.048-0.894) prior to admission were less likely to experience academic difficulty.

Low MMI scores are consistently prognostic for identifying students at greater risk of encountering academic difficulty. These data confirm previous analyses using MMI performance, GPA, and PCAT scores as predictors of academic difficulty and now suggest that prior degree(s) reduce the risk of academic difficulty.

Learning Objectives:
1.) Describe the Multiple-Mini Interview process
2.) Report the results of the Multiple-Mini Interview admissions process on academic difficulty

Self-Assessment Questions:
1.) The Multiple-Mini Interview process consist of:
   A. Multiple abbreviated interviews
   B. Multiple case-based scenario interviews
   C. Multiple extended interviews
   D. Multiple standard interviews

2.) The Multiple-Mini Interview process illustrated:
   A. Significant predictability of PCAT scores on academic difficulty
   B. Significant predictability of academic difficulty
   C. Significant predictability of GPA on academic difficulty
   D. No predictability for academic difficulty

Q1 Answer: A  Q2 Answer: B

UTILIZING A PHARMACIST CALCULATED 4T SCORE TO ASSESS THE APPROPRIATENESS OF HEPARIN-INDUCED THROMBOCYTOPENIA ANTIBODY TESTING. Livia Mackley, Joe Strain, Katie Hayes, Veronica Lesselyoung. Rapid City Regional Hospital, 353 Fairmont Blvd, Rapid City, SD 57701 lmackley@regionalhealth.com

The 4T scoring system is a validated method to predict the probability of a patient being diagnosed with heparin-induced thrombocytopenia. The proper use of this scoring system may help prevent unnecessary laboratory tests and expensive alternative drug therapies. The purpose of this study is to evaluate the appropriateness of heparin-induced thrombocytopenia antibody testing in relation to a pharmacist calculated 4T score.

A random sample of 150 patients with a heparin-induced thrombocytopenia (HIT) antibody test in the last year will be evaluated by a retrospective chart review. All information will be collected through an electronic medical record and will include age, sex, comorbidities, 4T data, HIT panel results, treatment received and adverse drug reactions of treatment. For each patient, a 4T score will be calculated by the principle investigator based on the degree of thrombocytopenia, timing of platelet count fall, presence of thrombosis or other sequelae, and presence of other causes for thrombocytopenia. Based on the score, the patient will be categorized as low, intermediate, or high risk for the development of HIT. From the HIT antibody test results and the calculated 4T scores, an assessment will be made regarding the appropriateness of ordering HIT antibody tests. An evaluation will be done to determine the need of a pharmacist calculated 4T score intervention prior to ordering a HIT antibody test. A cost savings analysis will also be performed using the cost of HIT panels, treatment, and adverse drug reactions from treatment.

Learning Objectives:
1. Calculate a 4T score and place patient in appropriate risk category
2. Explain the importance of a 4T score prior to a heparin-induced thrombocytopenia antibody test to other members of the health care team

Self Assessment Questions:
1. Which of the following are included in the 4T score?
   a. Treatment for thrombosis
   b. Timing of platelet fall
   c. Thrombocytopenia
   d. Both B and C

2. A low probability 4T score has a
   a. Positive predictive value for HIT
   b. Negative predictive value for HIT
   c. Equivocal predictive value for HIT
   d. No relation to predictive value for HIT

Q1 Answer: D  Q2 Answer: B
Since 2008, Oklahoma Poison Control Center has documented an average of 125 envenomations by crotaline snakes annually. Crotalidae polyvalent immune Fab antivenin (CroFab) may be used to neutralize envenomation effects. The objective of this study is to evaluate the impact of a pharmacy-designed protocol for envenomation treatment, adopted June 2011, which standardized doses and evaluation of symptom control.

Chart review was performed for patients who presented to the hospital with a snakebite from January 2009 to September 2013. Subjects were identified using quality data for ICD-9 codes e905.0 (venomous snakes and lizards causing poisoning and toxic reactions) or e906.2 (bite of nonvenomous snakes and lizards). Subjects were then divided into two groups based on whether the protocol was used for treatment. Data on vital signs, hematologic laboratory values, subjective symptoms and antivenin doses was collected for each subject. Results were evaluated to determine differences in initial dosing, length of stay, total vials administered, compliance with maintenance doses and readmission rates between the two groups. Initial doses were considered appropriate if no drug was used in mild envenomation, 4-6 vials were used in moderate envenomation, or 8-12 vials were used in severe envenomation. Control was considered achieved when platelet, fibrinogen, and partial thromboplastin time values normalized and the patient was clinically stable with improvements in neurologic symptoms and no swelling progression. Data was analyzed using descriptive statistics. Results will be used to evaluate the need for practice change. This study was approved by the Institutional Review and Ethics Board.

Learning Objectives:
1.) Describe the recommended antivenin dosing for pit viper snakebites.

Self-Assessment Questions:
1.) What is the recommended initial antivenin dose for a patient with a pit viper snakebite whose signs of envenomation include localized swelling and severe pain at the bite site?
   A. 0 vials
   B. 2 vials
   C. 4 vials
   D. 8 vials

Q1 Answer: A

EVALUATION OF INTRALUMINAL VOLUME DOSE ALTEPLASE FOR THE CLEARANCE OF OCCLUDED PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) LINES AT A LONG-TERM ACUTE CARE HOSPITAL. Stephen Sapienza and Darrin Ciaschini. HealthEast Care System - Bethesda Hospital. 559 Capitol Blvd., St. Paul, MN 55103. spsapienza@healtheast.org.

Peripheral inserted central catheter (PICC) lines are an essential part of IV therapy; however thrombotic occlusion is a relatively common complication. Alteplase is a fibrinolytic agent indicated for the clearance of thrombotic occluded central venous catheter lines. Alteplase’s mechanism of action involves prolonged contact with the occlusion via line dwell. Currently, the standard dose approved for this indication is 2 mg/2 mL. The intraluminal volume of the PICC lines in use at our long-term acute care hospital (LTACH) is less than 1 mL. While many studies have evaluated the efficacy of standard 2 mg/2 mL alteplase for clearing occluded PICC lines, there is very limited data regarding the efficacy of a 1 mg/1 mL dose.

The purpose of this study is to determine the safety and efficacy of a maximum of two doses of 1 mg/1 mL (intraluminal dose) alteplase as compared to a maximum of two doses of 2 mg/2 mL (standard dose) alteplase for the clearance of occluded PICC lines at our LTACH.

Eligible patients will be divided into two treatment groups (intraluminal and standard dose) and a daily report will identify any patients receiving a dose of alteplase in the previous 24 hours. The occlusion event will then be investigated via chart review.

The results of this study will be used to guide potential changes in the dosing of alteplase used for the clearance of occluded PICC lines in HealthEast patients. Successful implementation of intraluminal dosing will result in a significant cost savings for the health system.

Learning Objectives:
1.) Describe the mechanism of action and proper administration technique of alteplase.
2.) Identify patients in whom intraluminal (1 mg/1 mL) dosing of alteplase may be effective.

Self-Assessment Questions:
1.) Alteplase is a(n) _____ agent that exerts its mechanism of action best when administered via _____:
   A. Fibrinolytic; prolonged line dwell
   B. Antiplatelet; prolonged line dwell
   C. Fibrinolytic; rapid IV push
   D. Antiplatelet; rapid IV push

2.) Which of the following patients may be a candidate for intraluminal (1 mg/1 mL) dose alteplase?
   A. A patient with an occluded hemodialysis catheter line (volume 3.2 mL)
   B. A patient with an occluded peripherally inserted central catheter line (volume 0.77 mL)
   C. A patient with an occluded central venous catheter line (volume 1.2 mL)
   D. None of the above

Q1 Answer: A  Q2 Answer: B
Incidence of Serotonin Syndrome with Concomitant Use of Linezolid and Serotonergic Antidepressants Compared to Linezolid Monotherapy. Diana Karkow, Sarah Johnson, Jill Kauer and Erika Ernst. University of Iowa Hospitals and Clinics and College of Pharmacy, 200 Hawkins Dr., CC101 GH, Iowa City, IA 52242. diana-karkow@uiowa.edu

Linezolid is a weak monoamine oxidase inhibitor associated with an increased risk of serotonin syndrome (SS) in patients receiving serotonergic agents. In 2011, the FDA issued a safety announcement recommending the avoidance of linezolid within 14 days of a selective serotonin reuptake inhibitor (SSRI) or serotonin and norepinephrine reuptake inhibitor (SNRI), or discontinuation of the antidepressant in patients requiring linezolid for emergent use. Data on the risk of concomitant therapy are lacking.

The primary objective of this study is to determine the incidence of SS with concomitant linezolid and SSRI/SNRI therapy (CT) versus linezolid monotherapy (MT) at the University of Iowa Hospitals and Clinics (UIHC). Secondary objectives include evaluation of changes in linezolid prescribing following the FDA safety announcement, and assessment of the indication (emergent or non-emergent) for linezolid use in CT patients.

This study is a retrospective review of inpatients who received linezolid between January 2010 and June 2013. Patients with inpatient administrations of an SSRI/SNRI within 14 days of linezolid will be included in the CT group. The remaining patients will be eligible for the MT group. Three MT patients will be reviewed for each CT patient, and patients will be matched by age and gender. All patients will be evaluated for SS using the Hunter and Sternbach criteria for diagnosis of SS. Groups will be compared using a t-test or chi square test as appropriate and the results will be used to develop recommendations for linezolid use at the UIHC. Data collection is ongoing.

Learning Objectives:
1. Describe the interaction between linezolid and serotonergic agents and the risks associated with combination therapy.

Self Assessment Questions:
1. What adverse reaction may occur with the concomitant use of linezolid and serotonergic agents?
   A. QT prolongation
   B. Neuroleptic malignant syndrome
   C. Renal insufficiency
   D. Serotonin syndrome

Q1 Answer: D

COMPARISON OF OUTCOMES STATUS POST EXTERNAL VENTRICULAR DRAIN ANTIBIOTIC PROPHYLAXIS. Ashley R. Kral, Sarah J. Johnson, Erika J. Ernst, Birgir Johannsson; University of Iowa Hospitals and Clinics, 200 Hawkins Drive, Iowa City, IA 52242; ashley-kral@uiowa.edu

Extraventricular drains (EVDs) are frequently used for intracranial pressure monitoring. Extraventricular drain insertion places patients at risk for infection, which may result in increased morbidity, prolonged lengths of stay, increased costs, and death. Due to lack of evidence, there is no consensus regarding antimicrobial prophylaxis for EVDs. As a result, choice of antimicrobial agent and duration of prophylaxis varies greatly depending on the preference of individual practitioners. Current guidelines recommend a single dose of cefazolin for patients undergoing ventriculostomy procedures. At the University of Iowa Hospitals and Clinics (UIHC) cefazolin is the agent of choice for antimicrobial prophylaxis for EVD placement. However, prior to June 2011, nafcillin was used for antibiotic prophylaxis. Vancomycin is the alternative agent when the patient has a beta-lactam allergy or methicillin-resistant Staphylococcus aureus risk factors.

The purpose of this study is to examine outcomes at UIHC since the change from predominate use of nafcillin to cefazolin. The primary outcome measure is the incidence of infection after surgical placement of an EVD. The secondary outcomes include incidence of antibiotic-related adverse drug reactions and a cost comparison of antibiotics used for prophylaxis.

A retrospective chart review will be conducted for patients who meet the following inclusion criteria: at least 18 years of age; underwent EVD placement for the management of subarachnoid hemorrhage between October 2009 through March 2011 or September 2011 through September 2013; and received >24 hours post-operative antibiotic prophylaxis. Chi-square and t-tests will be used for dichotomous variables.

Data collection and evaluation are currently underway.

Learning Objective: Discuss key issues surrounding antibiotic prophylaxis for external ventricular drain placement.

Self-Assessment Question: Which of the following statements is correct?

A. Current guidelines recommend broad spectrum antibiotics for patients undergoing ventriculostomy placement.
B. Current guidelines recommend vancomycin for patients undergoing ventriculostomy placement.
C. There is a lack of strong evidence to support antibiotic prophylaxis for patients undergoing EVD placement.
D. There is strong evidence to support choice of antimicrobial agent and duration of prophylaxis for patients undergoing EVD placement.

Answer: C
Tranexamic acid is an antifibrinolytic agent that prevents the conversion of plasminogen to plasmin by preventing lysine from binding to sites on plasminogen. This effect leads to stabilization of fibrin clots. Tranexamic acid is known to prevent blood loss during hip and knee surgeries, and it has been shown to decrease the need for allogenic blood transfusions which carry the risk of disease transmission and increases health care costs.

The purpose of this study is to compare the estimated total blood loss between patients that receive tranexamic acid and those patients that do not receive tranexamic acid for elective knee arthroplasty. Secondary endpoints include the change in hematocrit from baseline along with the need for transfusion requirements after surgery.

The study was a retrospective drug utilization review of patients that had an elective total knee arthroplasty using a six month timeframe. Data was obtained from the pre-procedure office visit labs, anesthesia reports, operative reports, and post-procedure labs. Estimated total blood loss was calculated using the formula \( V_t = EBV \times \ln(H_v/H) \). Estimated blood volume was calculated based on the patient’s body mass index. Statistical analysis involved using a student’s t-test to compare means.

Tranexamic acid use was associated with decreased estimated total blood loss (1,376 mL vs. 1,670 mL; p=0.0458). Change in hematocrit from baseline was lower with tranexamic acid use 8.87% vs. 10.5%. However, the requirements for blood transfusion were the same between both groups. No patient in either group received allogenic blood transfusions.

Learning Objectives:
1.) Identify the difference in estimated blood loss in patients that received tranexamic acid and those that did not.

Self Assessment Question
1.) What was the difference in estimated total blood loss between the group of patients that received tranexamic acid and those that did not?
   A. 365mL
   B. 294 mL
   C. 125 mL
   D. 451 mL

Q1 answer: B 294 mL

Regional citrate anticoagulation and dextrose-containing replacement fluids may contribute unmeasured calories to critically ill patients on continuous venovenous hemofiltration (CVVH). Previous studies estimated the metabolic contribution of continuous renal replacement therapy at approximately 1,200 kilocalories per day. If not accounted for, these extra calories may contribute to detrimental overfeeding-related complications including hyperglycemia, hypercarbia, steatosis, electrolyte disorders, and fluid overload.

The objective of this study is to quantify the metabolic contribution of acid-citrate-dextrose regional anticoagulation and dextrose-containing replacement fluids used in the CVVH circuit.

This is a single-center, prospective, observational study in critically ill adults enrolled within 24 hours of CVVH initiation between March and April 2014. Based on CVVH census data, a projected sample size of 30 subjects is both feasible and clinically meaningful for this descriptive analysis. Citrate and dextrose concentrations will be measured at entry and exit sites of the CVVH circuit and used to calculate delivered kilocalories per hour. To compare changes in citrate and dextrose delivery over time, concentrations will be reported at two time points, 12 to 24 hours apart. Descriptive statistics will be used to illustrate patient and CVVH characteristics.

Study results will help clarify the caloric contribution of CVVH fluids in critically ill patients and allow practitioners to better tailor nutrition support provided via parenteral or enteral nutrition. Accurately adjusting nutrition support to account for hidden calories from CVVH may help limit the risk of overfeeding and its associated complications in this high risk patient population.

Learning Objectives:
1.) Explain how continuous venovenous hemofiltration may contribute to caloric gain in critically ill adults

Self Assessment Questions:
1.) Which of the following substance(s) has the potential to contribute systemic calories to critically ill patients undergoing continuous venovenous hemofiltration with regional ACD anticoagulation?
   a. Citrate
   b. Dextrose
   c. Sucrose
   d. A and B
   e. A and C

Q1 Answer: D
Hemodynamic instability occurs in over half of critically ill adults receiving dexmedetomidine. Unfortunately, the incidence estimates are imprecise and risk factors for hemodynamic instability remain uncertain.

The purpose of this study was to describe the incidence and significance of hemodynamic instability associated with dexmedetomidine and to identify patient- and treatment-specific risk factors with which it is associated.

This retrospective cohort study included critically ill adults who received dexmedetomidine for sedation at Mayo Clinic between November 1, 2012 and October 31, 2013. The primary endpoint was hemodynamic instability defined as a composite of hypotension (blood pressure <80 mmHg systolic or <50 mmHg diastolic) and/or bradycardia (heart rate <50 beats/minute) during dexmedetomidine therapy. Cox proportional hazards models will be constructed to determine hazards ratios and 95% confidence intervals for seven a priori-identified risk factors of hemodynamic instability in a planned sample size of 300 patients.

Interim analysis revealed 78 of 109 (76.1%) patients developed hemodynamic instability while receiving dexmedetomidine. Hypotension occurred in 72 patients (66.1%), while bradycardia occurred less commonly in 8 (7.3%). A multivariate analysis will be conducted to assess potential risk factors, including dexmedetomidine dose >0.7 mcg/kg/hr, low blood pressure or heart rate preceding dexmedetomidine initiation, body mass index, history of cardiac disease, concomitant administration of antihypertensives or antiarrhythmics, and severity of illness score.

Identifying independent predictors of dexmedetomidine-associated hemodynamic instability may aid clinicians in selecting the most appropriate patients to receive dexmedetomidine for intensive care unit sedation.

Learning Objectives
1. Define the incidence of dexmedetomidine-associated hemodynamic instability reported in previous literature
2. Recall characteristics predisposing patients who received dexmedetomidine to hemodynamic instability.

Self-Assessment Questions:
1. In previous literature, what is an approximate incidence of hypotension in adults receiving dexmedetomidine?
   A. 5%
   B. 10%
   C. 50%
   D. 85%

2. Which of the following have been identified as risk factors for dexmedetomidine-associated hemodynamic instability in previous literature?
   A. Initial mean arterial pressure <70 mmHg
   B. History of cardiac disease
   C. Use of dexmedetomidine loading doses
   D. A and C

Q1 Answer: C  Q2 Answer: D

Orthopedic surgeries are associated with a high rate of blood loss and transfusion. Allogeneic blood transfusion is not without risks; it is associated with many complications including a higher rate of mortality. Antifibrinolytic lysine analogs, tranexamic acid (TXA) and aminocaproic acid (EACA), have been shown to reduce blood loss in orthopedic surgery. However, their effect on blood transfusion is less well established, especially in settings without a transfusion protocol.

The purpose of this study is to determine if the perioperative administration of these agents reduces blood transfusion in the first 24 hours after the initiation of orthopedic knee and hip surgeries. Secondary end points of this study include the amount of blood transfused over the course of the entire hospital stay, blood transfused intraoperatively, blood transfused postoperatively, estimated blood loss, and the rate of thromboembolic events (MI, stroke, DVT, PE).

This retrospective chart review was approved by the Institutional Review Board prior to initiation. Patients age 18 and older who underwent orthopedic knee and hip surgery from 09/01/2011-09/01/2013 were identified from the electronic medical record. 211 patients that received TXA and 13 patients that received EACA were identified for data analysis along with a control group consisting of the first 250 patients that received neither agent.

The results of the study will be used to determine the utility of aminocaproic acid and tranexamic acid for reducing blood transfusions after orthopedic surgery and help more clearly define their place in therapy.

Learning Objective:
1. Recall the mechanism of action by which lysine analogs exert their effects.

Self Assessment Question:
1. Through what mechanism do the lysine analogs aminocaproic acid and tranexamic acid reduce blood loss?
   (A) Activation of vitamin K-dependent clotting factors, leading to increased clot formation
   (B) Act as exogenous thromboxane, stimulating platelet aggregation, thereby resulting in increased clot formation
   (C) Bind prostacyclin, which inhibits vascular smooth muscle relaxation, resulting in increased vascular spasm
   (D) Bind plasmin, preventing it from binding fibrin and thereby preventing fibrinolysis, which results in clot stabilization

Answer: D
POTENTIAL IMPACT OF IMPLEMENTING A STANDARDIZED ALLERGY DOCUMENTATION SYSTEM WITH A TIERED ALLERGY COMPONENT. Ryan Birk, Joann Moore, Korby Lathrop, and Brittany Melton. The University of Kansas Hospital, 3901 Rainbow Boulevard, Mailstop 4040, Kansas City, Kansas 66160 rbirk@kumc.edu

In response to the Medicare and Medicaid Electronic Health Incentive Program, institutions have implemented electronic health records (EHR) that have perpetuated the number of user alerts. When alerts are displayed, users override these warnings between 49-96% of the time. Also many electronic health records lack differentiation of a patient’s medication allergy, contraindication, intolerance, or severity when triggering an alert. This promoted the Institute for Safe Medication Practices to recommend that a tiered severity rating, based on the patient’s reaction to an allergen, be utilized to limit alert fatigue.

The purpose of this study was to evaluate the current state of allergy documentation and alerts. Allergy documentation was reviewed on 50 patients and a total of 163 total allergies. Only 6% (3 of 50) of patients had complete allergy documentation that included the allergen, type of reaction, severity, and date the reaction was noted. A reaction was documented for 72% (118 of 163) of patient allergies and the severity of the reaction was documented for 13% (22 of 163) of patient allergies. Upon further review, 38% (63 of 163) of allergies were actually intolerances instead of true allergies. After evaluating the allergy alert data, an average delay in order verification of 67 minutes was noted when an allergy alert was fired and needed additional clarification.

The results of this study will be used to implement an organization-wide allergy documentation policy and tiered allergy alert system.

Learning Objectives:
1.) Discuss the clinical and operational impact of allergy alerts on patient safety.
2.) Describe the benefits of a standardized organization-wide allergy documentation process.

Self-Assessment Questions:
1.) Allergy alerts:
   A. Are overridden greater than 50% of the time
   B. Can delay medication verification and administration
   C. Always improve patient care
   D. Both A and B

2.) Standardized allergy documentation helps:
   A. Providers with medication selection
   B. Ensure 100% clinical success
   C. Improve first-line agent utilization
   D. Both A and C

Q1 Answer: D  Q2 Answer: D

IMPLEMENTATION OF LEAN METHODOLOGY TO REDUCE MISSING MEDICATIONS AT A 600 BED GENERAL MEDICAL AND SURGICAL FACILITY. Sunaina Rao, Chris Bell. University of Kansas Hospital, 3901 Rainbow Blvd, Mailstop 4040, Kansas City, Kansas 66160 srao3@kumc.edu

At the University of Kansas Hospital (UKH), data suggests approximately 3,600 missing medication requests are made by nursing weekly despite distribution through centralized automation (CA). Audits show the accuracy of doses dispensed from CA to be greater than 99.7%. Lean methodology, originating in the manufacturing arena, has been applied in the health-care setting as an approach to improve the quality and efficiency of processes while providing safe and effective patient care. The goal of Lean is the identification and elimination of waste through root cause analysis, to achieve value – in terms of resources, time or money – for the organization and its customers or patients. This project aims to improve the efficiency of the medication delivery process and quality of patient care through analysis and reduction of missing medication requests and re-dispenses.

Two patient-care units were selected for analysis of redispenses and missing medication requests between August 1 to August 31, 2013. Root-cause analysis, led by a Lean consultant, determined the ambiguity in the location of medications, lack of knowledge about medication delivery process, and rebalancing of medications in automated dispensing cabinet stock to be impactful areas for intervention. Post-intervention data was collected between January 16 to February 15, 2014 for each unit.

Primary outcome measures will be the change in number of doses and events dispensed as well as the number of missing medication messages processed. Secondary outcomes measures will include costs associated with labor involved in re-dispensing missing medications pre- and post-intervention.

Learning Objectives:
1. Describe the usage of Lean methodology
2. Report impact of education, inventory optimization and appropriate location labeling on missing medications requests and re-dispenses

Self-Assessment Question:
1. Which process is utilized by Lean methodology for identification of waste
   A. Six Sigma
   B. Kaizen or Continuous Improvement
   C. Root Cause Analysis
   D. Incident Management

Q1 Answer: C
EVALUATION OF NURSE DRIVEN MEDICATION INDICATION AND SIDE EFFECT TEACHING DURING MEDICATION ADMINISTRATION. Christina Luke, Krista Gens, Megan Matack, North Memorial Medical Center, 3300 Oakdale Avenue North, Robbinsdale, MN 55422. christina.luke@northmemorial.com

Patient education on medication indications and possible side effects is a critical component to patient care during hospitalization. Patients who understand medication indications are more likely to continue to take them correctly once they are discharged from the hospital. The objective of this study is to evaluate the effectiveness of nurse driven medication indication and side effect teaching.

In an effort to enhance and formalize medication side effect teaching, a 6-month pilot was initiated on several units of a level-one trauma center and affiliated community hospital. Following bedside barcode scanning, nurses were prompted with a scripted alert within the electronic medical record indicating the drug name, indication, and common side effects that was triggered every 48 hours a medication was administered. The scripted alert included over 30 classes of medications and was developed by pharmacists based on the medication class. The alert states: “This is your medication (A), it is for (B). Possible side effects include (X, Y, and Z). Would you like to receive additional information on this medication?” The primary objective of the study is an evaluation of changes seen in information on this medication through North Memorial Health Care.

The results of this study will be used to implement changes in medication teaching to improve patient satisfaction and HCAHPS scores throughout North Memorial Health Care.

Learning Objectives:
1. Describe HCAHPS and how pharmacy and nursing can work collaboratively to improve scores.

Self-Assessment Question:
1. HCAHPS is:
   A. A survey taken by healthcare providers to improve hospital quality initiatives
   B. A survey sent to select patients following discharge from the hospital as a national standard for collecting information on hospitals
   C. A data collection system that tracks hospital admissions and diagnoses
   D. A survey taken by every patient prior to discharge from the hospital that gathers information about their hospital stay

Q1 Answer: B

IMPACT OF A PHARMACIST RUN MEDICATION THERAPY MANAGEMENT CLINIC ON APPROPRIATE GASTROESOPHAGEAL REFUX DISEASE TREATMENT. Kayla Hughes, William Hayes, Carrie Hock, Amy Doten, Veterans Affairs Black Hills Health Care System, 113 Comanche Road, Fort Meade, SD 57741. Kayla.Hughes@va.gov

An eight week trial of proton pump inhibitors in patients with typical Gastroesophageal Reflux Disease (GERD) symptoms is the first line treatment for resolving symptoms and confirming a GERD diagnosis. Unnecessary longer durations of therapy may expose patients to undue adverse risks, drug interactions, and prescription costs.

The main objective of this quality improvement project was to enhance patient care through identifying patients receiving inappropriate long term omeprazole therapy and enrolling them in a pharmacist run medication therapy management (MTM) clinic to taper off omeprazole or to the lowest effective dose for the patient.

Education was provided to pharmacists on the 2013 GERD guidelines, tapering procedures, and documentation in the electronic medical record. A sample of primary care providers’ patients who had been on omeprazole for greater than eight weeks but less than one year for a diagnosis of GERD or without documented indication were identified through a retrospective chart review. Patients were enrolled into the MTM clinic and followed for a four month time period for evaluation of omeprazole therapy and tapering medication to the lowest effective dose. A cost savings analysis was also performed.

The results of this project will serve to identify the pharmacist’s impact on assisting patients in tapering omeprazole to the lowest effective dose and the need for continuation of this service within the MTM clinic.

Learning Objectives:
1.) Identify the appropriate duration of initial proton pump inhibitor therapy for gastroesophageal reflux disease.
2.) List potential adverse risks associated with prolonged use of proton pump inhibitors.

Self Assessment Questions:
1.) Which is the following is the correct initial duration of proton pump inhibitor therapy for treatment of GERD?
   A. 6 weeks.
   B. 8 weeks.
   C. 1 year.
   D. Indefinite Therapy.

2.) Which of the following is/are potential adverse risks associated with prolonged proton pump inhibitor use?
   A. Hypermagnesemia
   B. Hypomagnesemia
   C. Clostridium difficile infection
   D. Both B and C

Q1 Answer: B. Q2 Answer: D.
EVALUATION OF MALE PATIENTS AT HIGH RISK FOR OSTEOPOROSIS. Andrew Koneche, Amy Doten, William Hayes, Michael Lemon, Jessica Mitchell, Veterans Affairs Black Hills Healthcare System (VA BHHCS), 113 Commanche Rd, Fort Meade, SD 57741. Andrew.Koneche2@va.gov

In recent years much emphasis has been placed on prevention of osteoporosis in women, but there has been considerably less focus placed on males, which make up more than 90% of US veterans. The aim of this quality improvement project was to identify male patients at highest risk for fracture, evaluate them for treatment, and treat utilizing an osteoporosis algorithm. Secondarily, effectiveness of education provided to staff was evaluated.

First, a search was conducted to identify veterans at highest risk for osteoporosis. This was determined by an evidence based review of male osteoporosis to be patients with a previous osteoporotic fracture, patients taking oral glucocorticoid therapy for more than 3 months, and patients who have received androgen deprivation therapy. Second, clinical pharmacists were educated regarding the osteoporosis algorithm, associated therapies, and laboratory tests. A pre and post survey was taken to evaluate the effectiveness of provided education. Third, after a provider consult was placed, high risk patients were evaluated by clinical pharmacists and treated based on the osteoporosis algorithm and education provided.

The results of this quality improvement project will serve to assess the project’s impact on the number of high risk veterans appropriately evaluated, detection of osteoporosis, initiation of treatment for osteoporosis, and to evaluate if patients were being treated in accordance with the algorithm prior the project’s initiation. These results will serve to identify the need for continuation of this service within the VA BHHCS Medication Therapy Management Clinic.

Learning Objectives:
1.) Recognize which male patients are at highest risk for developing osteoporosis.
2.) Identify the potential impact of a Pharmacy Medication Therapy Management Clinic on the treatment and detection of osteoporosis.

Self Assessment Questions:
1.) Which of the following indicates the most significant risk for the development for osteoporosis?
   A. Treatment with androgen deprivation therapy for prostate cancer
   B. Elderly patients treated with high fall risk medications such as anticholinergics
   C. Treatment with intermittent glucocorticoid therapy for COPD such as prednisone
   D. Previous fracture related to a motor vehicle accident

2.) In this quality improvement project, which outcome was the Pharmacy Medication Therapy Management Clinic shown to have improved upon regarding osteoporosis?
   A. Number of patient deaths related to osteoporotic hip fractures
   B. Number of patients continuing to take high doses of corticosteroids
   C. Reduction in osteoporotic fractures among veterans
   D. Number of patients at high osteoporosis risk undergoing appropriate evaluation

Q1 Answer: [A] Q2 Answer: [D]

IMPLEMENTATION OF CLINICAL PHARMACY SERVICES IN THE EMERGENCY DEPARTMENT AT A RURAL VETERANS AFFAIRS HEALTHCARE SYSTEM: A QUALITY IMPROVEMENT PROJECT. Shawn Dalton, Amy Doten, Michael Lemon, Kelly Moran. VA Black Hills Healthcare System, 500 N. 5th Street, Department of Pharmacy, Hot Springs, SD 57747. Shawn.Dalton@VA.gov

The emergency department (ED) has a fast-paced environment with a primary focus of delivering safe and immediate care. The ED also presents the ideal setting for medication errors. ED studies have found that 3.6% of patients receive an inappropriate medication during admission and 5.6% receive an inappropriate medication at discharge. Additionally, patients receive approximately two prescriptions per ED visit. The majority of these medication orders are not reviewed by a pharmacist for appropriateness or safety. Implementation of pharmacy services at this facility could have a large impact on the quality and safety of patient care in the ED.

The primary objectives of this quality improvement project were to assess provider perception of the implementation of clinical pharmacy services and to track and extrapolate all pharmacist interventions into potential cost savings and safety data. Healthcare professionals were asked to complete pre/post-implementation questionnaires regarding the implementation of pharmacy services. Following the initial questionnaire, the pharmacy resident was available every Monday in the ED and an additional pharmacist was available on the other days of the week for a total of one month. All pharmacist interventions were tracked using a Microsoft Excel spreadsheet and estimated cost savings were calculated based on previously published intervention data. The follow-up questionnaire was used to assess changes in staff perception in regards to implementation of clinical pharmacy services. Results of this quality improvement project will be used to create a business plan requesting a full-time clinical pharmacy position within the ED.

Learning Objectives:
1. Describe the need for clinical pharmacist in the emergency department
2. Discuss questionnaire results and potential cost savings with a clinical pharmacist in the emergency department

Self Assessment Questions:
1. Approximately ______ percent of emergency department patients receive an inappropriate medication during admission or at discharge and the majority of these orders are not reviewed by a pharmacist.
   A. 10-20
   B. 1-2
   C. 3.5-5.5
   D. 5-15

2. Based on the results of the initial questionnaire, most providers felt that pharmacy services:
   A. Would not improve safety or quality of care for patients in the emergency department
   B. Would improve safety but not the quality of care for patients in the emergency department
   C. Would improve quality of care but not safety for patients in the emergency department
   D. Would improve safety and the quality of care for patients in the emergency department

Q1 Answer: C Q2 Answer: D
Evans syndrome is generally a diagnosis of exclusion. It is characterized by autoimmune hemolytic anemia (AIHA), and the presence of immune thrombocytopenia (ITP) with or without immune neutropenia. These conditions can be classified as idiopathic, or secondary to an autoimmune or malignant process. Patients with Evans syndrome experience cytopenias as a consequence of an autoimmune reaction. The auto-antibodies responsible for AIHA and ITP are specific to each individual cell type. Recurrent episodes of bleeding, thrombocytopenia, anemia, and infections characterize the disease. There are often cycles of acute flares followed by periods of remission. Evans syndrome generally requires multiple treatments (sequential or concurrent) to attain stable blood cell counts.

The purpose of this single-center retrospective chart review is to evaluate the treatment options and response rates of patients diagnosed with Evans syndrome. The primary outcome of this study is to evaluate response rates associated with different treatment options used in patients with Evans syndrome. Secondary outcomes include characterizing the demographics and underlying conditions associated with Evans syndrome and describing the treatment modalities used to manage both acute and chronic symptoms for this patient population. These objectives will be assessed from data obtained from the patient's medical records and will be analyzed using descriptive statistics.

The results of this study will add to the current body of literature on this disease state and provide other health care providers additional information on the treatment options used in the management of patients with Evans syndrome. Data collection and evaluation are currently ongoing.

Learning Objectives:
1. Identify treatment options utilized in the management of patients with Evans syndrome

Self-Assessment Questions:
1. Which of the following is most commonly used as the first line treatment option for patients with the autoimmune hemolytic anemia component of Evans syndrome?
   a. IVIG
   b. Corticosteroids
   c. Rituximab
   d. Cyclosporine

Q1 Answer: b. Corticosteroids

Carboplatin, a widely utilized agent in the treatment of numerous malignancies, is typically dosed using the Calvert formula \[ \text{dose} = \text{AUC}^2 \times (\text{GFR}+25) \]. Concern for overprediction of clearance in overweight and obese patients leading to unnecessarily high doses and unwarranted toxicities has contributed to a trend for dose-reduced therapy in this population, despite recommendations for use of actual body weight when calculating chemotherapy doses. Studies have demonstrated decreased toxicity rates in obese patients, supporting concern for substandard doses which may negatively impact outcomes in this population. Controversy regarding rounding of serum creatinine values or capping GFR further complicates dosing and introduces additional practice variability.

The purpose of this study is to evaluate appropriateness of carboplatin dosing calculations, accounting for obesity and renal impairment, and assess observed toxicities in those patients. Additionally, this study seeks to determine how to optimally standardize carboplatin dosing at our institution.

Patients who received carboplatin September 1, 2011 through October 31, 2013 were included. Exclusion criteria were hematologic malignancies, documented bone marrow involvement, and receipt of carboplatin prior to September 1, 2011. Primary outcome measures are observed rates of thrombocytopenia and leukopenia as well as subsequent dose reductions or treatment delay. Secondary outcome measures are dose deviations from the expected carboplatin dose per calculation. Two hundred ninety-two eligible patients were identified and stratified based on body mass index classifications as underweight, normal weight, overweight, and obese. Outcomes remain under investigation, with data collection and evaluation currently being conducted.

Learning Objective:
1. Discuss carboplatin dosing strategies and implications with consideration for renal function and obesity

Self Assessment Question:
1. Which of the following statements are correct?
   a. Carboplatin is typically dosed using the Calvert formula \[ \text{dose} = \text{AUC}^2 \times (\text{GFR}+25) \].
   b. Studies utilizing treatment-related toxicities as a surrogate marker for dosing adequacy have demonstrated increased toxicities in obese patients.
   c. Using ideal body weight to calculate creatinine clearance in an obese patient can lead to underestimation of clearance and subsequently result in suboptimal dosing of carboplatin.
   d. A & B
   e. A & C

Answer: E
Poor pain control is one of the most feared symptoms by cancer patients which negatively impacts quality of life. There is growing evidence that links adequate pain control to survival. Undertreatment of cancer pain is commonly reported despite the availability of effective therapies. Implementation of pain management guidelines remains a major problem in clinical practice with pain assessment identified as a main barrier.

The purpose of this study was to evaluate pain assessment practices in patients with solid tumors admitted to the oncology floor who received parenteral opioids. A retrospective chart review of solid tumor patients admitted to the oncology floor between June 1 and December 31, 2013 who received parenteral opioids was conducted. Compliance with NCCN guidelines for cancer pain assessment practices was evaluated. Documentation of pain intensity, characteristics, management goal, and reassessment was measured as part of pain assessment practices.

Ninety nine patients were included in the analysis. Evaluation of pain assessment practices showed 87% compliance with pain intensity documentation. Pain characteristics were reported in 69% of the patients upon pain onset and pain management goal was documented in 93% of patients during hospital stay. Pain reassessment documentation within one hour of parenteral opioid dose was achieved 43% of the time.

A multidisciplinary collaboration is needed to identify barriers and apply quality improvement practices aiming at improving pain assessment and reassessment practices.

Learning Objectives:
1) Describe the National Comprehensive Cancer Network (NCCN) recommendations for cancer pain assessment
2) Discuss compliance with NCCN pain assessment practice guideline in patients with solid tumors admitted to the oncology floor who received parenteral opioids

Self Assessment Questions:
1. Which of the following is recommended by the National Comprehensive Cancer Network (NCCN) guideline for adult cancer pain as part of the pain assessment practices?
   A. Pain intensity should be assessed every four hours
   B. Pain characteristics should be assessed every four hours
   C. Pain should be reassessed 30 minutes post oral opioid dose
   D. Pain should be reassessed 15 minutes post parenteral opioid dose

2. Based on the results of this study, which of the following pain assessment practices had the lowest compliance rate with the NCCN guideline?
   A. Pain intensity documentation
   B. Pain characteristics documentation
   C. Patient’s pain management goal documentation
   D. Pain reassessment documentation

Q1 Answer: D  Q2 Answer: D
IMPACT OF PHARMACIST INTERVENTION ON INAPPROPRIATE STRESS-ULETER PROPHYLAXIS PRESCRIBING PRACTICES IN A COMMUNITY HOSPITAL SETTING. Lisa Pham, Steven Blanner, Linda Radke, and Lisa Crosley, Salina Regional Health Center, 400 South Santa Fe Avenue, Salina, KS 67401. lpham@srhc.com

The ASHP Gastrointestinal Stress Ulcer Prophylaxis Guidelines have identified that patients in the ICU in conjunction with other risk factors increases the risk for developing stress ulcers. Many patients may be inappropriately prescribed and subsequently discharged on acid-suppressive agents. Inappropriate prescribing has the potential to lead to increased healthcare costs, adverse reactions, and long-term complications.

The primary objective of this study is to analyze the impact pharmacists have on the inappropriate use of stress-ulcer prophylaxis (SUP) in a community hospital setting. The ASHP Gastrointestinal SUP Guidelines served as the standard for evaluation of appropriateness of SUP therapy in ICU patients. A retrospective analysis of electronic medical charts was performed serving as baseline data. Pharmacy was granted approval to assess, dose, and discontinue SUP on patients in the ICU. A comparison of SUP prescribing practices in the ICU before and after pharmacist intervention will then be conducted.

Upon retrospective review, the following information was extracted:
- When SUP was initiated, 44% of the time it was inappropriate according to ASHP guidelines.
- SUP was continued upon transfer out of the ICU onto another medical floor 76% of the time.
- SUP was continued upon discharge to home or to another facility 22% of the time.

Preliminary results revealed that pharmacist involvement in stress-ulcer prescribing practices could improve patient outcomes by reducing inappropriate use and continuation of acid-suppressive agents out of the ICU setting and upon discharge home or to another facility.

Learning Objectives:
1.) Describe the impact of pharmacy intervention on stress-ulcer prophylaxis prescribing practices.

Self Assessment Questions:
1.) Pharmacy intervention on stress-ulcer prophylaxis prescribing practices has the potential to:
   a. Reduce inappropriate stress-ulcer prophylaxis initiation
   b. Reduce the continuation of stress-ulcer prophylaxis out of the ICU
   c. Increase the continuation of stress-ulcer prophylaxis upon discharge to home
   d. Both A and B

Q1 Answer: D

EVALUATION OF EMERGENCY DEPARTMENT INITIAL ANTIMICROBIAL AGENTS IN PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK. Sarah Minner, Craig McCammon, and Jennifer Smith, Barnes-Jewish Hospital, 1 Barnes Jewish Hospital Plaza, St. Louis, MO 63110 sarah.minner@bjc.org

Sepsis guidelines emphasize early antimicrobial administration with a regimen that covers likely pathogens. Current literature deems a regimen appropriate if cultures are susceptible to the initial antimicrobial regimen within the first 48 hours of hospitalization. Additionally, minimal data exist evaluating antimicrobial management and outcomes of patients with severe sepsis or septic shock who have no microbial growth of cultures obtained prior to antibiotics.

A retrospective chart review of patients originating from a large, urban, academic emergency department will evaluate appropriate initial choice of antimicrobial therapy based on patient-specific characteristics that modify treatment choice, such as suspected source of infection, drug allergies, renal dysfunction and risk of resistant organisms. This study will describe outcomes and antimicrobial use in patients with severe sepsis and septic shock in culture positive and culture negative patients. Descriptive statistics and chi-squared analyses will be performed.

This study will provide transparency of initial empiric antimicrobial use in patients who present to Barnes-Jewish Hospital Emergency Department with severe sepsis or septic shock. This study will also provide antimicrobial management and outcome data for the subset of patients who have negative cultures. Evaluation of these areas will provide insight into potential areas of improved patient care.

Learning Objectives:
1.) Recognize deficits in guidelines and literature regarding the definition and practice of initial, appropriate antimicrobial use.

Self Assessment Questions:
1.) Current literature describes appropriate initial antimicrobial use based on
   a. antibiotic administration in intensive care units.
   b. the growth of pathogens that are susceptible to initial antimicrobial regimens.
   c. the administration of antimicrobials prior to obtaining cultures.
   d. A and B.

Q1 Answer: D
Pharmacy liaisons are technicians responsible for medication delivery tasks to an assigned hospital floor. In an effort to provide better pharmacy services at our institution a pharmacy liaison position was created. This study will look to measure the value of this position. The primary objective is to determine if there is a reduction in the number of completed medication returns for credit (credits) within 72 hours of discharge on floors served by the pharmacy liaison. Secondary objectives will compare the number of missing medications, automated dispensing unit refills, and completed patient medication reconciliations in the first 24 hours of admission.

This study is exempt from the Institutional Review Board due to use of preexisting medical data. The electronic medical records of patients who were admitted during the month of October 2013 to the two floors that have a pharmacy liaison will be compared to patients on two similar floors without a pharmacy liaison. Population size was determined to be 60 patients per group using an alpha of 0.05, beta of 0.2, and effect size of 20%. Data collected for each group will include: credits, missing medications, refill times, medication reconciliations, patient satisfaction scores and any medication event reports. The primary outcome will be evaluated using chi-square. Other data will be evaluated using the t-test, chi-square, or descriptive statistics as appropriate. The results will be used to evaluate the current program and opportunity for expansion to improve patient care and pharmacy services.

Learning Objectives:
1. Describe the value and responsibilities of pharmacy liaison services
2. Describe opportunity for expansion and improvement to the program through demonstrated outcomes

Self-Assessment Questions:
1. The Pharmacy Liaison is responsible for:
   A. Medication delivery
   B. Verifying medication orders
   C. Medication compounding
   D. Answering medication questions

2. The primary outcome is to demonstrate a decrease in:
   A. Medications delivered
   B. Medication reconciliations
   C. Completed credits of returned medications
   D. Patient satisfaction

Q1 Answer: A  Q2 Answer: C

As part of ongoing efforts to integrate technology to facilitate clinical pharmacy services, the feasibility of implementing an innovative clinical scoring tool in a large acute care hospital setting was studied. The primary objective was to assist pharmacists with patient prioritization. Secondary objectives were to increase the number of pharmacist interventions, improve pharmacist-to-pharmacist communication and increase pharmacist job satisfaction.

A six-week pilot was launched on a busy patient care unit to study the feasibility of implementing the tool hospital-wide. Training sessions and educational handouts were offered to pharmacy staff prior to the launch of the pilot. During the study period, the average percentage of patients reviewed with the tool was assessed once to twice a day. The impact of other daily pharmacist tasks (i.e. number of pharmacy-to-dose consults, medication orders and interventions) on patient profile reviews was also studied. A pre-pilot survey was sent to pharmacists to assess their existing strategies for patient profile reviews. A post-pilot survey will be sent to gather feedback regarding conducting patient profile reviews using the clinical scoring tool.

Primary results showed no direct correlation between the number of patients reviewed using the clinical scoring tool and other daily pharmacist tasks, indicating the tool could be used despite fluctuations in workflow. Additionally, initial pharmacist feedback has been positive describing the tool as both efficient and effective. Limitations appear to be minor and resolvable. Further data analysis is needed to validate these conclusions.

Learning Objective:
1.) Report the results of a clinical scoring tool implemented in a busy patient care unit of a large acute care hospital setting

Self Assessment Question:
1.) Implementation of the tool showed:
   A. Decreased patient profile reviews with increased number of pharmacy-to-dose consultations
   B. Decreased patient profile reviews with increased number of medication orders
   C. Major and complex areas for improvement
   D. Positive pharmacist feedback regarding efficiency and efficacy of the tool

Q1 Answer: D
The primary objective of this study is to compare the effects of BLIS to Trinity Health's peri-articular injection, consisting of bupivacaine, ketorolac, and morphine, on postsurgical pain scores in patients undergoing total knee or hip arthroplasty. Secondary objectives include comparing postsurgical opioid and antiemetic consumption, adverse effects, time to participate in physical therapy and return to daily activities, length of stay, and patient satisfaction.

Patients will be randomized to either injection. Patients and personnel involved with postoperative assessments will be blinded to assigned treatment arm. Pain scores while active and at rest will be patient-reported using a standard numeric rating scale. Patient satisfaction and time to return to activities of daily living will be assessed using a patient-completed questionnaire. All other secondary outcomes will be determined using chart review. Descriptive statistics will be calculated, and chi-square and Fisher's exact test will be used to compare arms.

The results of this study will provide additional evidence regarding the efficacy and feasibility of incorporating BLIS as a standard of care in multimodal pain management for major orthopedic procedures conducted at Trinity Health.

Learning Objectives:
1. Discuss current multimodal pain management strategies and guidelines.
2. Identify potential advantages and disadvantages for the use of bupivacaine liposome injectable suspension in patients undergoing total knee or total hip arthroplasty.

Self-Assessments:
1. According to current guidelines, which of the following is not an appropriate agent for managing acute perioperative pain?
   a. Oxycodone ER
   b. Ketorolac
   c. Gabapentin
   d. Acetaminophen

2. Which of the following are disadvantages of BLIS compared to the standard peri-articular when used in patients undergoing total knee or total hip arthroplasty?
   a. Additional stability and storage limitations
   b. Increased cost of drug
   c. Eliminates the need for other any other analgesics
   d. A & B

Q1 Answer: A  Q2 Answer: D
CROSS-SECTIONAL STUDY EXAMINING THE DIFFERENCES IN THE PREVALENCE OF HEALTH SERVICE DEFICITS AMONG US ADULTS WITH AT LEAST ONE CHRONIC ILLNESS OF COPD, ASTHMA, ARTHRITIS, AND/OR DIABETES 10 YEARS PRIOR TO AND 10 YEARS AFTER MEDICARE ELIGIBILITY. Catherine J. Kucharyski, M. Nawal Lutfiyya, Kristina A. Dittrich, John T. Grygelko, Cassandra L. Dillon, Taylor J. Hill, Matthew P. Rioux, and Krista L. Huot, Essentia Health - St. Mary’s Medical Center, 407 East Third Street, Duluth, MN 55805. catherine.kucharyski@essentiahealth.org

With the planned implementation of the Affordable Care Act in the United States, we hypothesize that there will be an overall reduction in health service deficits (HSDs) for those covered by the proposed overhaul in health care insurance. HSDs are defined as no routine medical exam, no primary care provider, no health insurance, and/or a deference of medical care because of cost, all within the last 12 months. In the US, Medicare is the only example of universal health insurance and is routinely available only to adults 65 and older. To test the hypothesis that universal health insurance may result in a reduction of HSDs, we chose to use the US Medicare population as a proxy for a universally insured population. Bivariate and multivariate analyses were performed on 2011 Behavioral Risk Factor Surveillance System (BRFSS) data to compare the prevalence of HSDs among US adults with at least one chronic illness (COPD, asthma, arthritis, and/or diabetes). Multivariate analysis yielded that US adults 55 to 64 years of age with at least one chronic illness had greater odds of HSDs than those adults ages 65 to 74 years (OR=2.715, 95% CI 2.710-2.719). Adults 55 to 64 years of age with chronic illness who had greater odds of having a health service deficit were: low or middle SES, unmarried or not living with a partner, non-Caucasian, living in a rural area, and male.

Learning Objectives:
1. Compare the prevalence of HSDs among US adults with at least one chronic illness 10 years prior to and 10 years after Medicare eligibility
2. Describe the patient characteristics of adults age 55 to 64 years with chronic illness which are associated with greater odds of having a health service deficit

Self Assessment Questions:
1. In this study, which age group of US adults with at least one chronic illness had greater odds of having HSDs, adults aged 55 to 64 years or adults aged 65 to 74 years?
   a. Adults 55 to 64 years of age
   b. Adults 65 to 74 years of age
   c. There was no difference between the age groups
2. In this study, which patient characteristic was associated with greater odds of having a health service deficit?
   a. Married
   b. Caucasian
   c. Living in rural area
   d. Female

Q1 Answer: A  Q2 Answer: C

USING CLINICAL DECISION SUPPORT (CDS) TO MONITOR FOR RISK OF DRUG INDUCED TORSADES DE POINTES (TDP) WITHIN A COMPUTER PROVIDER ORDER ENTRY (CPOE) SYSTEM. David Nguyen, Davina Dell-Steinbeck, Brian Rodden. SMHC, 6420 Clayton Road, Richmond Heights, MO 63117. David_Nguyen@ssmhc.com.

CDS is an information system designed to improve clinical decision making. It uses characteristics of the patient in combination with a computerized knowledge base and software algorithm to generate a patient-specific recommendation. Practitioners can utilize the recommendation to improve clinical decision making at the time of medication order entry. This system will help improve patient care by monitoring for appropriate medication selection during order entry. TdP is an arrhythmia that can lead to sudden cardiac death. Therefore, careful monitoring of drugs with a known potential to induce TdP is important and will help prevent this serious complication from occurring.

The purpose of this study is to determine if using CDS within the Epic system has an effect on monitoring drugs known to cause TdP. The primary outcome is the number of pharmacy interventions made by pharmacists after the implementation of the new CDS alert. The secondary outcomes are the number of pharmacy interventions accepted by physicians and the number of modifications made by physicians and medical staff in response to the alert.

Outcomes are assessed by using a weekly report that generates a list of patients with CDS alerts for the corresponding drugs. Descriptive analysis will be used to evaluate the outcomes. The results of this study will be evaluated to determine if CDS has an effect on monitoring for the risk of drug induced TdP.

Learning Objective:
Describe the effect of clinical decision support on computerized provider order entry.

Self-Assessment Question:
Which of the following statement is correct regarding the effect of clinical decision support on computerized provider order entry?
   a) Clinical decision support improves daily workflow
   b) Clinical decision support decreases providers’ performance
   c) Clinical decision support improves decision making at the ordering stage
   d) Clinical decision support enhances patients’ satisfaction

Q1 Answer: C

The pharmacy vancomycin dosing service utilizes actual body weight to initiate dosing and to estimate renal function. The study evaluated the effectiveness of pharmacy and physician vancomycin dosing in a population of obese and non-obese patients with respect to the number of dose modifications required to reach target trough levels. The incidence of nephrotoxicity, the differences in calculated renal function using different measures of body weight, and the success of reaching a target trough upon initial dosing were also analyzed.

A randomized retrospective chart review compared 120 pharmacy- and physician-dosed obese and non-obese patients. Patients were eligible for selection if they received at least 3 doses of vancomycin between January 1, 2013, and June 30, 2013, with at least one appropriate trough level collected. Exclusion criteria included: dialysis, pregnancy, or weight less than 45 kilograms. The following data was collected: age, weight, gender, doses, troughs, serum creatinine, blood urea nitrogen, co-administration of select anti-infective agents, critical care status, and the presence of congestive heart failure or ascites. Descriptive statistics will be used to analyze the collected data. This study has been approved by the Institutional Review and Ethics Board.

The results of this study will be used to improve the pharmacy vancomycin dosing service at Saint Francis Hospital.

Learning Objectives:
1. Discuss the 2009 IDSA/ASHP/SIDP Vancomycin guideline as it relates to dosing of vancomycin in obese patients.
2. Describe the results of a retrospective chart review at Saint Francis Hospital.

Self-Assessment Questions:
1. Which of the following measures of body weight do the 2009 IDSA/ASHP/SIDP vancomycin guidelines recommend for the dosing of vancomycin in obese patients?
   a. Ideal body weight
   b. Lean body weight
   c. Actual body weight
   d. Adjusted body weight

2. Which patient group had the greatest number of initial vancomycin trough levels greater than 20 mcg/mL?
   a. Physician obese
   b. Pharmacy obese
   c. Physician non-obese
   d. Pharmacy obese

Self-Assessment Answers
1. C
2. B
Inhaled tobramycin is commonly used in pediatric patients with cystic fibrosis (CF) to prevent and treat bacterial lung infections. This therapy delivers medication directly to the site of infection while reducing systemic concentrations and the risk of toxicity. In CF patients, inhaled tobramycin has been proven safe in clinical trials and is considered a standard of care for patients colonized with *Pseudomonas aeruginosa*. Inhaled tobramycin is also utilized to prevent and treat lung infections in non-CF patients colonized or infected with gram negative bacteria. However, the safety of inhaled tobramycin in patients without CF is unclear, and case reports of adult transplant patients describe toxicity from elevated systemic tobramycin levels. At The Nebraska Medical Center (TNMC), inhaled tobramycin is used in non-CF pediatric patients for the treatment of bronchiectasis, prevention of pneumonia, and in combination with intravenous antibiotics for the treatment of pneumonia.

The purpose of this retrospective observational study is to evaluate dosing strategies employed and systemic tobramycin levels achieved in non-CF pediatric patients treated with inhaled tobramycin at TNMC. Outcomes of interest include the percentage of patients treated with inhaled tobramycin who achieve detectable serum tobramycin levels and the percentage of patients with levels above 1 mcg/ml. Possible relationships between systemic tobramycin levels and evidence of toxicity will also be examined. Based on the study results, current TNMC dosing strategies of inhaled tobramycin in non-CF pediatric patients will be analyzed to evaluate if changes are necessary.

Outcomes remain under investigation with data collection and evaluation currently being conducted.

**Learning Objectives:**
Describe the use of inhaled tobramycin in pediatric patients without cystic fibrosis.

**Self Assessment Questions:**
1. Inhaled tobramycin is used in non-cystic fibrosis pediatric patients for which of the following indications?
   a. Prevention of pneumonia in patients colonized with gram negative bacteria
   b. Treatment of gram-negative sepsis in patients with CF
   c. Prevention of strep throat in immunocompromised patients
   d. Surgical prophylaxis in patients with bronchopulmonary dysplasia

**Q1 Answer:** A

**EVALUATION OF AIRWAY CULTURES AND EMPERIC COMBINATION ANTIBIOTIC REGIMENS: A QUALITY IMPROVEMENT STUDY.** JK Sturgeon, Melissa Steenhoek, Michael Carr, CoxHealth, 3801 S. National Ave, Springfield, MO 65807 jk.sturgeon@coxhealth.com

The objective of this study was to evaluate the frequency and susceptibility of bacterial pathogens from inpatient airway samples and compare them to current empiric antibiotic regimens. The evaluation of samples included identifying the frequency of methicillin-resistant Staphylococcus aureus (MRSA) and Gram-negative rods. Susceptibility of the Gram-negative rods was organized into a combination antibiogram, which will determine the combination of antibiotics that will provide the most effective empiric Gram-negative double coverage.

The health system’s electronic medical record system was used to compile a list of all inpatient airway samples from January 1st through June 30th, 2013. Culture and sensitivity data for Gram-negative rods from airway samples were compiled and organized into a Microsoft Access® database. By matching data from both sources, we observed the frequency of Gram-negative organisms seen in pulmonary infections and created a combination antibiogram to show the efficacy of various combinations of antimicrobial agents.

1318 respiratory samples were cultured during the 6 month study period, showing 6.8% MRSA and 21.2% Gram-negative rods. 233 Gram-negative respiratory cultures had susceptibility data available. For this institution, the most effective empiric Gram-negative double coverage combination was piperacillin-tazobactam and levofloxacin.

This institution’s current empiric regimen of cefepime and ciprofloxacin for health-care associated pneumonia had low combined susceptibility compared to other antibiotic combinations. Alteration of the pneumonia order set could provide more effective empiric coverage to a larger percentage of patients.

**Learning Objectives:**
1.) Describe the potential benefits from the utilization of combination antibiograms
2.) Interpret the results of a combination antibiogram and create appropriate empiric antibiotic regimens

**Self-Assessment Questions**
1.) Combination antibiograms can:
   a. Compare effectiveness of different combinations of antibiotics
   b. List the minimum-inhibitory concentration (MIC) of multiple antibiotics
   c. Report the frequency in which at least one of a pair of antibiotics covers a pathogen (or group of pathogens)
   d. A and C

2.) Based on the provided final combination antibiogram, which combination of antibiotics would be LEAST effective for empiric coverage of Gram-negative rods?
   a. piperacillin-tazobactam and tobramycin
   b. aztreonam and gentamicin
   c. cefepime and levofloxacin
   d. imipenem and amikacin

**Q1 Answer:** D  **Q2 Answer:** B
MEASURING OUTCOMES OF PATIENTS RECEIVING LIPOSOMAL BUPIVACAINE VERSUS TRADITIONAL PAIN CONTROL. Maria Agunsoye and Virginia Ghafoor, University of Minnesota Medical Center, Fairview, 420 Delaware St SE, Minneapolis MN 55455. magunso1@fairview.org

Pain is a protective mechanism; however, in the setting of post-operative patient management it is an unwanted side effect. Traditionally, opioids have been used to manage patient pain but given their list of potential adverse effects, utilizing methods that spare opioid usage could be very beneficial. Multimodal approaches to pain management are important measures that should be considered in order to decrease opioid usage. Liposomal bupivacaine is a local anesthetic formulation intended for single dose administration/infiltration of the surgical site for post-surgical analgesia. FDA indicated for post-operative analgesia after bunionectomies and after hemorrhoidectomies.

The medication was added to this institution’s formulary in 2012. The purpose of this retrospective study (01/01/13 to 06/30/13) in adult patients was to conduct a medication use evaluation to assess the efficacy of liposomal bupivacaine at this institution and to identify the sub-group(s) of surgical patients that appear to benefit the most and then provide recommendations regarding potential guidelines for use.

In colectomy patients at this institution, the distribution appears to favor the group of patients who received liposomal bupivacaine; this group had a lower usage of opioids in the three days after surgery with an average of 29.74 mg of oral morphine compared to an average of 43.21 mg of oral morphine in the group that did not receive liposomal bupivacaine. The pain scores on post-operative days 1, 2, and 3 ranged from 0-6 and 1-9 for each of the aforementioned groups respectively. It is currently unknown whether these differences are statistically significant.

Learning Objectives:
1. Describe the impact of multimodal approach to pain management
2. Report the results of conducting a medication use evaluation on liposomal bupivacaine at a large academic medical center

Self Assessment Questions:
1. Multimodal approach to pain management is:
   a. Too much work for nursing staff
   b. A way to minimize Opioid usage in patients
2. Medication use evaluation is a tool that is:
   a. A waste of time
   b. Important to routinely assess current institution practice(s) for areas of improvement

Q1 Answer: B  Q2 Answer: B

EVALUATION OF DAPTOMYCIN USE FOR HIP, KNEE, AND SHOULDER PROSTHETIC JOINT INFECTIONS. Quang Cao, Christine Bowman-Hall, and Kimberly Boeser, University of Minnesota Medical Center, Fairview, 420 Delaware Street. SE, Minneapolis, MN 55455. qcao1@fairview.org

Prosthetic joint infection (PJI) occurs in 0.5-2% of joint replacement surgeries with anticipated rise in the near future. PJIs can be difficult to manage because of the presence of biofilms on the prostheses, as well as the delivery of the antibiotic to the site of infection. Based on data from limited case reports, clinical trials, and expert opinion, the 2012 Infectious Diseases Society of America (IDSA) PJI guideline recommended daptomycin as an alternative option for specific resistant gram-positive organism infections. Our institution has experienced an increase in use despite, limited safety and efficacy data that supports the use of daptomycin over other standard of care antibiotics for gram positive resistant PJIs.

The purpose of this study is to assess the clinical efficacy and safety of daptomycin in the management of hip, knee, and shoulder PJIs at our institution. Secondly, it will be determined whether the use of daptomycin is in accordance with IDSA guidelines and the antimicrobial restricted policy at our institution. Lastly, the type of microorganisms contributing to PJIs will be characterized and appropriateness of daptomycin treatment will be determined.

This is a retrospective study (01/01/12 to 2/11/14) of adult patients diagnosed with gram-positive hip, knee, or shoulder PJIs treated with daptomycin.

The results of this study could help support recent data that daptomycin can be a viable option to treat gram positive resistant pathogens, as well as help determine if our institution needs to reevaluate daptomycin use for PJI if data illustrates inappropriate use.

Learning Objectives:
1. Describe the impact of prosthetic joint infections (PJI) on patient’s quality of life.
2. Recognize the pathogens associated with PJIs.

Self Assessment Questions:
1. What is the benefit of a joint replacement?
   A. Provide symptom relief
   B. Decrease joint function
   C. Improve mobility
   D. Both A and C

2. Which of the following bacterial species is commonly associated with PJIs?
   A. Enterobacteriaceae species
   B. Staphylococcal species
   C. Propionibacterium species
   D. Enterococcus species

Q1 Answer: D  Q2 Answer: B

Q1 Answer: B  Q2 Answer: B
Antimicrobial stewardship programs reduce healthcare expenditures, improve patient outcomes, and reduce the emergence of antimicrobial resistant pathogens. The Antimicrobial Management Team (AMT) at the University of Minnesota Medical Center, Fairview (UMMC) is a partnership between an infectious diseases pharmacist and infectious diseases physicians. AMT assesses restricted antimicrobials for appropriate use based on institution established guidelines. The team provides recommendations for optimization of antimicrobial regimens.

Piperacillin-tazobactam has a broad spectrum of activity and is effective in the treatment of complicated lower respiratory tract infections, intra-abdominal infections, skin and soft tissue infections, septic shock, and febrile neutropenia. Piperacillin-tazobactam utilization has not been restricted at UMMC.

The purpose of this study is to evaluate and optimize the usage of piperacillin-tazobactam at UMMC. A retrospective review of piperacillin-tazobactam use was conducted to characterize utilization prior to implementation of guidelines for use. All patients receiving piperacillin-tazobactam during the study period were included (n= 200). These patients were randomly assigned to either standard of care (n= 100) or review by AMT (n= 100) for appropriateness of use. If AMT determined that use of piperacillin-tazobactam was not appropriate, they intervened to optimize use. The primary outcome measures are days of therapy of piperacillin-tazobactam, total antibiotic days of therapy, and antimicrobial expenditures.

Evaluation and optimization of piperacillin-tazobactam use remain under investigation, with data collection and analysis currently being conducted.

Learning Objectives:
1) Discuss the objectives of antimicrobial stewardship programs
2) Describe piperacillin-tazobactam utilization in relation to interventions of an antimicrobial stewardship program

Self Assessment Questions:
1) Antimicrobial stewardship programs:
   A. Improve patient outcomes
   B. Reduce the emergence of antimicrobial resistant pathogens
   C. Reduce healthcare expenditures
   D. All of the above
2) Piperacillin-tazobactam is NOT indicated for:
   A. Complicated peritonitis
   B. Uncomplicated urinary tract infection
   C. Severe nosocomial pneumonia
   D. Complicated skin and skin structure infections

Q1 Answer: D  Q2 Answer: B
CREATION AND IMPLEMENTATION OF POLICY FOR INTRANASAL MEDICATION ADMINISTRATION. Amanda R. Vander Tuig, Jared T. Marx, Carly J. Brown, Ashley F. Harbison, Tyler Kenney, Samaneh T. Wilkinson; The University of Kansas Hospital, 3901 Rainbow Blvd, Mailstop 4040, Kansas City, KS 66160. avandertuig@kumc.edu

In the settings of acute pain, seizures, or medication overdoses, prompt administration of medications is imperative to optimal outcomes and patient satisfaction. Recently, research has demonstrated that the intranasal route of medication administration may provide a promising alternative to traditional administration challenges.

Intranasal delivery offers a unique route of administration that may facilitate maximal efficiency in providing patient medications. It provides a number of advantages over other administration routes:

1. The rich vasculature of the nasal cavity provides absorption directly into the bloodstream, avoiding first-pass metabolism by the liver.
2. For many intranasally administered medications, the absorption rates, onsets of action, and plasma concentrations are similar to intravenous administration, and frequently better than subcutaneous or intramuscular routes.
3. Intranasal medication administration is relatively painless and does not require sterile technique or the obtention of an intravenous line.

The purpose of this project is to create and implement an institution-specific policy and procedure for the intranasal administration of medications.

A pre-survey of emergency department and pediatric intensive care unit nurses will be conducted to assess concerns and prior knowledge of this route of administration. Education will be tailored to the results of the survey and the demonstrated needs of the nursing staff.

After the implementation of the policy and procedure, a nursing satisfaction survey will be conducted to assess the effectiveness of the intranasal administration. Additionally, a chart review will be performed of all doses administered to assess the occurrence of adverse events and appropriateness of dosing.

LEARNING OBJECTIVES:
1. Create and implement a policy and procedure for an alternative route of administration

SELF ASSESSMENT QUESTIONS:
1. Which of the following is correct?
   a. Intranasally administered medications are subject to first-pass metabolism by the liver
   b. Intranasally administered medications have similar plasma levels to intravenously administered medications
   c. Intranasal medication administration is painful for patients
   d. Intranasal medication administration requires sterile technique in medication preparation

Q1 Answer: B

USE OF FLUCONAZOLE AS PROPHYLAXIS FOR INVASIVE CANDIDA INFECTIONS IN PRETERM INFANTS: A RETROSPECTIVE CHART REVIEW. Stephanie Le, Wendy Weber, Eric Hoie, Christopher Destache, Harold Kaftan, Alegent Creighton Health: Creighton University Medical Center, 601 N. 30th Street, Omaha, NE 68131 stephaniele@creighton.edu

Invasive Candida infections are associated with high mortality and poor outcomes in preterm infants. Fluconazole is the antifungal agent of choice for invasive Candida infection prophylaxis due to its excellent pharmacokinetic profile. However, the extent of fluconazole use in preterm infants differs by birth weight, gestational age, and risk factors between institutions. The objective of this retrospective study is to determine whether the use of fluconazole prophylaxis has reduced the incidence of invasive Candida infections among infants who were born less than 30 weeks gestation, with birth weight of less than 1,500 grams and central venous access since implementing the routine prophylaxis at a level III neonatal intensive care unit in June 2008.

Secondarily, the incidence of adverse events, mortality rate due to Candida infections, and length of hospital stay will be assessed. Specific risk factors associated with Candida infection will be evaluated: use of antibiotics, histamine-2 blockers, systemic corticosteroids, and methylxanthines; supplementation with total parenteral nutrition; and mechanical ventilation. A subgroup analysis will then be made between infants who had a birth weight between 1,000 and 1,499 grams in comparison to those with a birth weight of less than 1,000 grams. Non-descriptive and descriptive statistics will be used to compare differences between the five-year pre- and post-implementation patient populations.

The hypothesis of this study is that a significant reduction in the number of cases of invasive Candida infection will be seen in both the very low and extremely low birth weight preterm infants who received fluconazole prophylaxis.

Learning Objectives:
1) Identify the complications associated with invasive fungal infections in preterm infants.
2) Describe the pharmacokinetic profile of fluconazole used for invasive Candida infection prophylaxis.

Self Assessment Questions:
1) Which of the following are consequences associated with invasive fungal infections?
   a) Hyperkalemia
   b) Severe stages of retinopathy of prematurity
   c) Severe neurodevelopmental impairment
   d) A and B
   e) B and C

2) Fluconazole is an antifungal agent of choice for invasive Candida infection prophylaxis due to its:
   a) Excellent penetration into the cerebrospinal fluid
   b) Renal clearance
   c) Long half-life
   d) A and B
   e) A and C

Q1 Answer: E Q2 Answer: E
Infection in the neonatal population is difficult to identify, yet early effective treatment is crucial to improve morbidity and mortality. Vancomycin remains the mainstay of an initial treatment regimen of suspected gram-positive infections. In neonates, traditional dosing models (utilizing weight and gestational age) often do not result in therapeutic trough levels without further dosage adjustments. This study will evaluate the rate of initial therapeutic trough attainment of a literature supported creatinine-based vancomycin dosing regimen as compared to the traditional dosing model from Neofax.

The study was approved by the Institutional Review Board. The electronic medical record system identified patients that had received vancomycin during a six month period prior to and after implementation of the practice change. The study was conducted in a retrospective manner through post-discharge chart review. The following data was collected: patient gestational age (GA), serum creatinine, weight, vancomycin dosing regimen, initial vancomycin level, timing of level, goal therapeutic range, and concurrent medications. All recorded data remained confidential without patient identifiers. There were four subject groups, two from each dosing model, one 28 weeks GA or younger, and the other over 28 weeks GA. Data analysis occurred by comparing both dosing models within the two age groups on whether the initial, appropriately drawn level was within the accepted therapeutic range.

The findings of this study will be used to assess the creatinine-based vancomycin dosing regimen, and to guide future practice and research within the neonatal intensive care unit, allowing for adjustments based on patient specific pharmacokinetic parameters.

Learning Objective:
Describe patient characteristics to consider when dosing vancomycin in the neonatal population.

Self-Assessment Question #1:
Which patient characteristic(s) should be considered when dosing vancomycin in a neonate?

- a. Postnatal age
- b. Urine output
- c. Body surface area
- d. Creatinine

Answer is D
Pharmacists are well positioned to educate and help asthma patients gain and maintain control of their asthma symptoms. Asthma education falls under the practice of pharmacy; however, spirometry, an objective measure to assess pulmonary function, has not traditionally been conducted by pharmacists. The Rapid City PHS Indian Hospital implemented a pediatric asthma service, in which the pharmacists act as asthma educators with the plan to conduct spirometry when appropriate.

The aim of this study was to examine the performance outcomes of asthma patients in a pharmacist-run asthma education service. The primary asthma outcomes were based from the Healthy People 2020 measures, namely: hospitalizations and emergency room or urgent care visits due to asthma. The secondary outcome measures observed school days missed, frequency of oral steroid use and rescue inhaler refills, frequency of asthma symptoms, and knowledge evaluation.

These objectives will be assessed through a retrospective chart review prior to initial visit and 6 month prospective chart review after initial visit to the Asthma Service. Subjects are Native Americans from 5 to 19 years of age who have asthma with at least one visit at the Asthma Service. Paired t-test and Wilcoxon-signed ranked test will be conducted to compare groups. To adequately power the study, 25 subjects are needed. Currently, four patients have been referred to the Asthma Service.

Moving forward, the Asthma Service will encourage referrals of eligible patients. Procurement of spirometry with training for pharmacists is planned this year. The study will continue until enough subjects have been enrolled.

Learning Objectives:
1) Describe the implementation of a pharmacist-led pediatric asthma service
2) Discuss how to evaluate the impact of the pediatric asthma service

Self-Assessment Questions:
1) Pharmacists are able to bill for which of the following professional services, if properly trained and credentialed?
   A. Asthma Education
   B. Spirometry
   C. Medication Therapy Management
   D. All of the Above

2) Which of the following is the BEST indicator of asthma morbidity?
   A. Prescribing patterns of asthma medications
   B. Spirometry or other pulmonary function test results
   C. Asthma-related emergency department visits
   D. Adherence of the national asthma guidelines by health care providers

Q1 Answer: D  Q2 Answer: C

Pharmacists have the necessary education and training to provide patient-centered medication-related education through discharge counseling and have the ability to resolve medication related problems prior to discharge by conducting medication reviews. Additionally, 30-day re-admittance is becoming a concern as Medicare and insurance payors are reducing reimbursing for readmissions. Improving a patient's health literacy, providing one-on-one discharge counseling and reviewing medications prior to discharge are methods that institutions are utilizing to combat this problem.

The primary objective of this study was to determine if discharge medication counseling and medication review would affect 30-day re-admittance rates in high and/or moderate risk patients. Secondary objectives included evaluating patient satisfaction of a pharmacist run discharge service and the current discharge process to determine areas for improvement.

This prospective, cohort study took place within the CoxHealth South Hospital on two medical/surgery floors for three weeks. Patients were identified as high or moderate risk using the Crimson Real Time® readmission platform or nursing request. Discharge medication counseling was provided prior to discharge from the hospital and a follow-up phone call was used to assess patient satisfaction seven days post discharge. A control sample from the same units was obtained for comparison.

The results of this study will be used to evaluate 30-day readmission rates of patient who received discharge counseling compared to those that did not. Additionally, the current transition of care process within the health system and patient satisfaction of a pharmacist driven discharge counseling service will be assessed.

Learning Objectives:
1) Describe the benefits of a pharmacist run discharge counseling service within an inpatient health system
2) Discuss barriers to success when implementing a pharmacist run discharge counseling service

Self Assessment Questions:
1) Benefits of a pharmacist run discharge counseling service include:
   A. Patient satisfaction
   B. Decrease in patient medication understanding and compliance
   C. Decrease in 30-day re-admittance
   D. Both A and C

2) Barriers of success related to implementing a pharmacist run discharge counseling service include:
   A. Patient resistance to pharmacy involvement
   B. Lack of FTE to support role
   C. Lack of communication between health care staff
   D. Both B and C

Q1 Answer: D  Q2 Answer: D
ENOXAPARIN PROPHYLAXIS IN TRAUMA PATIENTS.
Katie Norton, Scott Taylor, Via Christi Hospitals Wichita, Inc., 929 N St Francis, Wichita, KS 67214  kathryn.norton@viachristi.org

Trauma patients are at a high risk of deep venous thromboembolism (DVT) due to endothelial injury, hypercoagulability, and venous stasis. In these patients, enoxaparin, a low molecular weight heparin (LMWH), is used for DVT prophylaxis. Enoxaparin therapy does not require monitoring however antifactor Xa levels have been used to determine dosing efficacy. Recent studies have shown that trauma patients are achieving subprophylactic levels of antifactor Xa which have been linked to an increased risk of DVT.

The primary objective of this study is to determine the rate of subprophylactic antifactor Xa levels in trauma patients receiving standard DVT prophylactic dosing with enoxaparin. The second objective is to identify correlations between possible risk factors and subprophylactic antifactor Xa levels.

These objectives will be assessed by obtaining data from patients’ health records from June 2013 to December 2013. The primary objective will be assessed using a chi-square test and the secondary objective will be assessed using a multivariable regression model.

The results of the study may be used to determine the necessity of antifactor Xa levels and/or the subpopulation of trauma patients who may benefit from antifactor Xa levels.

Learning Objectives:
1.) Discuss deep venous thromboembolism (DVT) prophylaxis with enoxaparin
2.) Determine if standard enoxaparin prophylaxis provides adequate antifactor Xa levels in trauma patients

Self Assessment Questions:
1.) What is the mechanism by which enoxaparin provides DVT prophylaxis?
   a. Reduces platelet counts
   b. Inhibits factor Xa
   c. Lyses developing clots
   d. None of the above
2.) The majority of antifactor Xa levels were:
   a. Subprophylactic
   b. Prophylactic
   c. Supraprophylactic
   d. Both A and C

Q1 Answer: B  Q2 Answer: (unknown at this time)

CHARACTERISTICS OF A 30-DAY READMISSION POPULATION USING ADVERSE DRUG EVENT DATA.
Meghan Haftman, Jim Garrelts, Lyndsey Hogg, Todd Schroeder. Via Christi Hospitals Wichita, Inc., 929 N St Francis, Wichita, KS 67214. Meghan.Haftman@viachristi.org

Hospital admissions related to medication errors have resulted in a 20 % increase in cost and 8.25% increase in duration of stay. Studies have shown that pharmacist involvement at time of patient discharge can reduce medication errors, leading to a decrease in 30-day readmissions, overall cost and increased patient satisfaction.

The purpose of this study is to examine the association between 30-day hospital readmissions and adverse drug events (ADEs), based on ICD-9 codes, at Via Christi Hospitals Wichita. The primary objective is quantification of ADEs based on ICD-9 codes in patients readmitted to the hospital within 30 days. The secondary objective is identification of risk factors associated with higher incidences of ADEs.

This retrospective chart review was approved by the Institutional Review Board. Data was collected from the electronic health record to identify adults who had been readmitted to the hospital within 30 days, during the time period from May 2012 to September 2013, with an ADE. Demographics and potential risk factors for ADEs, such as age, gender, ethnicity, payor source, number of medications, co-morbid conditions, and length of stay were gathered to determine if an association existed between those factors and the presence of an ADE based on ICD-9 codes.

Data analysis is ongoing. A correlation model will be used to determine correlation of ADEs with possible risk factors and descriptive statistics will be calculated. Results will be utilized to identify and target high risk patient populations for implementation of pharmacist involvement in the discharge process.

Learning objective:
1.) Discuss the ramifications of adverse drug events on hospital readmission

Self assessment questions:
1.) Adverse drug events causing readmission have been shown to
   a. Increase costs
   b. Cause irreversible patient harm
   c. Increased patient satisfaction
   d. Both A and B

Q1 answer: D
Diabetic ketoacidosis (DKA) is the cause of numerous hospitalizations annually. Many interventions are needed by practitioners in order to stabilize a patient with DKA, including fluid replacement, correction of hyperglycemia, and normalization of electrolytes. Studies have shown that using order sets for the treatment of DKA result in positive outcomes including faster resolution time, fewer episodes of hypoglycemia, shorter time in the intensive care unit, and shorter hospital length of stays.

The purpose of this study is to evaluate the implementation of the order set in regards to patient safety, efficacy, and nursing staff satisfaction. A retrospective chart review of patients admitted to the medical intensive care unit for DKA from June 7, 2011 – June 7, 2013 will be performed. A survey of nursing staff will be performed to assess satisfaction and obtain feedback for order set improvement.

The primary outcome measured in this study will be length of time to resolution of DKA. Secondary outcomes measured will include length of stay in the medical intensive care unit and hospital, incidence of patients experiencing hypoglycemia, hypokalemia, and hyperkalemia, total amount of fluids received prior to resolution of DKA, amount of insulin received prior to resolution of DKA, percent of patients when insulin infusion stopped prior to resolution of DKA, and nursing staff satisfaction and input with the current order set.

The information gathered through this study will help to improve the order set for future patient care.

Learning Objectives:
1.) List the criteria for resolution of diabetic ketoacidosis.

Self Assessment Questions:
1.) Which of the following laboratory tests would be a criteria to be considered for the resolution of DKA:
   a. Blood glucose < 300mg/dL
   b. Serum bicarbonate > 10 mEq/L
   c. Venous pH > 7.2
   d. Anion gap ≤ 12mEq/L

Q1 Answer: d

The incidence of heart failure (HF) in the United States has increased exponentially in recent years, and this trend is believed to continue. Technological advances with the creation of implanted left ventricular assist devices (LVADs) have provided options to patients who have progressed to end-stage HF. Currently, the HeartMate II LVAD is the device of choice at our institution. This is a second-generation, continuous-flow device. First-generation LVADs are pulsatile-flow devices that more closely mimicked the natural physiology of a normal beating heart. The continuous-flow devices are associated with a four-fold increased risk of developing a gastrointestinal (GI) bleed as compared to the pulsatile-flow LVADs, which may be a result of the development of arteriovenous malformations (AVMs) and acquired von Willebrand disease related to the continuous-flow mechanism.

Patients that require LVAD implantation have a number of risk factors that may predispose them to GI bleeding. Most patients with an LVAD require lifelong anticoagulation due to the risk for thrombosis with the device. In addition, depression is quite common in the HF population, and thus many are treated with serotonergic agents. There is evidence to suggest that serotonergic agents have been associated with an increased incidence of GI bleeds.

The primary outcome measure of this study will be the incidence of GI bleeds in patients with an LVAD concomitantly using serotonergic agents versus LVAD patients who are not using serotonergic agents.

Learning Objectives:
1) Participants should be able to explain the mechanism by which serotonergic agents may predispose patients to an increased risk of gastrointestinal bleeding.

Self-Assessment Questions
1) By what mechanism are serotonergic agents thought to be associated with an increased risk of gastrointestinal bleeds? (A) Inhibition of prostaglandin synthesis, (B) Direct irritation of gastric mucosa, (C) Antagonizing the uptake of serotonin into platelets, (D) Development of arteriovenous malformations

Question 1 Answer: (C) Antagonizing the uptake of serotonin into platelets
COMPARISON OF ENOXAPARIN WITH UNFRACTIONATED HEPARIN (UFH) FOR VENOUS THROMBOEMBOLISM (VTE) PROPHYLAXIS IN MEDICALLY ILL DIALYSIS PATIENTS.
Amanda Buckallew, Katie Buehler, and Brian Lee, Missouri Baptist Medical Center, 3015 N. Ballas Road, St. Louis, MO 63131. Amanda.Buckallew@bjc.org

The safety and efficacy of enoxaparin compared to UFH for VTE has been established in patients with normal and reduced renal function. However, limited evidence exists on clinical outcomes of enoxaparin for VTE prophylaxis in dialysis patients. The objective of this study is to determine if enoxaparin is at least as effective as UFH for the prevention of VTE in medically ill patients requiring dialysis.

This single-center, retrospective, cohort study will include nonsurgical patients at least 18 years old on hemodialysis or peritoneal dialysis, receiving at least 24 hours of thromboprophylaxis with either enoxaparin or UFH. Two hundred patients per treatment group will be enrolled consecutively, in reverse chronological order, beginning with July 1, 2012. The primary outcome is the occurrence of thromboembolic event. Secondary outcomes include the occurrence of major bleeding (symptomatic bleeding in a critical area or organ or as a decrease in hemoglobin of at least 2 g/dL or a transfusion of at least 2 units of blood), minor bleeding (bleeding not meeting the criteria for major bleeding but associated with an increase in level of care), and injection site hematoma.

The results of this study may provide insight as to whether enoxaparin is inappropriate for VTE prophylaxis in patients receiving dialysis. Furthermore, the results of this study may reveal whether dialysis patients receiving enoxaparin for VTE prophylaxis are more likely to have VTE and/or bleeding event(s). Overall, this may lead to improved prescribing habits and increased patient safety.

Learning Objectives:
1. Explain the concerns associated with enoxaparin use for VTE prophylaxis in dialysis patients.
2. Discuss study methods and results.
3. Describe the study limitations and potential applications to clinical practice.

Self-Assessment Questions:
1. What is a concern related to enoxaparin use in dialysis patients?
   a. It is administered subcutaneously
   b. Limited evidence is available regarding its use
   c. It is known to cause thromboembolic events
2. According to the methods of this study, which agents used for thromboprophylaxis will be compared?
   a. Enoxaparin vs. UFH
   b. Enoxaparin vs. warfarin
   c. Enoxaparin vs. bivalirudin
3. Which of the following is most correct regarding the present study and the use of enoxaparin in dialysis patients?
   a. This study will not improve patient safety.
   b. This study may provide useful safety and efficacy information.
   c. This study will increase prescribing of enoxaparin for VTE prophylaxis.

Q1 Answer: B  Q2 Answer: A  Q3 Answer: B

ASSESSMENT OF BLOOD GLUCOSE CONTROL IN GENERAL MEDICINE PATIENTS TREATED WITH SUBCUTANEOUS INSULIN IN A COMMUNITY HOSPITAL.
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The American Association of Clinical Endocrinologists (AACE) and the American Diabetes Association (ADA) state that irrespective of the cause, hyperglycemia in hospitalized patients is correlated with adverse outcomes. The AACE and ADA have provided blood glucose (BG) targets and recommendations for the management of inpatient hyperglycemia. The purpose of this study is to investigate the level of blood glucose control in general medicine patients treated with subcutaneous insulin at our institution and to discover what subcutaneous insulin regimen is most successful in obtaining BG control.

The institution’s electronic medical record system was used to retrospectively review charts of adult, general medicine patients who were prescribed subcutaneous insulin during September 2013. The insulin regimen and all point-of-care glucose readings were recorded for each patient-day. Based on recommendations by the AACE and ADA that random BG be controlled at < 180 mg/dL and the insulin regimen should be reassessed at a BG < 100 mg/dL, our target BG range is 100 – 180 mg/dL.

The primary endpoint is the percentage of patient-days that the mean BG is within the target range in general medicine patients treated with subcutaneous insulin at our institution. The secondary endpoints are the mean BG value, the incidence of hypo- and hyperglycemic events, and the differences in BG control between subcutaneous insulin regimens. The result of this study will be used to educate pharmacists on the desired insulin regimen for general medicine patients and direct physician prescribing habits to improve blood glucose control at our institution.

Learning Objective:
1.) Describe the preferred insulin regimen for the management of hyperglycemia in non-critically ill patients according to the AACE and ADA.

Self Assessment Question:
1.) The preferred components of a glucose control regimen in non-intensive care unit patients include:
   A. Correction insulin and oral antihyperglycemic medication
   B. Correction insulin and basal insulin
   C. Basal insulin and bolus/nutritional insulin
   D. Basal insulin, bolus/nutritional insulin and correction insulin

Q1 Answer: D
IMPACT OF HOSPITAL PHARMACY ON HOSPITAL CONSUMER ASSESSMENT OF HEALTHCARE PROVIDERS AND SYSTEMS (HCAHPS) SURVEY RESULTS.

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The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey assesses hospital patient satisfaction, including that regarding communication about medication indication and side effects. The objective was to determine the number and types of pharmacist-patient encounters needed to improve the percentage of patients who respond to medication-related HCAHPS questions with a score of 4.

All discharged patients between January, 2011 and October, 2013 who returned HCAHPS surveys and were given a new medication were included. Patients without documented pharmacy notes served as the control group. A total of 8,919 patients were included in this study with 30% of patients having one or more pharmacy note. No statistically-significant differences were observed in the percentage of “4’s” for medication-related questions between the control group and the patients whose medication history was taken by a pharmacist. Adding medication education and/or discharge counseling did not result in a higher percentage. However, an improvement for the medication side-effect question was shown in patients who received education about either transplant medications (47% vs. 59%; p=0.007) or warfarin (47% vs. 76%, p <0.05). In addition, a statistically higher percentage of patients with four or more extensive encounters with a pharmacist gave a score of 4 for the indication question.

The presence of documented pharmacy notes was not associated with higher percentage of patients rating medication-related HCAHPS questions with a score of 4. However, transplant medication or warfarin education and multiple extensive pharmacist-patient encounters were shown to improve the percentage for the side-effect or indication question, respectively.

Learning Objectives:
1.) Describe the impact of Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results on hospital reimbursements
2.) Identify the types of pharmacist-patient encounters that positively influence scores of medication-related HCAHPS questions

Self-Assessment Questions:
1.) What percentage of the total score for hospital value-based purchasing does HCAHPS account for?
   A. 50%  B. 70%  C. 30%  D. 35%
2.) What type(s) of pharmacist-patient encounter by pharmacists was associated with a significantly higher percentage of patients giving a score of 4 for the medication side-effect question in this study?
   A. Warfarin education  B. Transplant medication education  C. Medication history  D. A and B

Q1 Answer – C  Q2 Answer – D

DRUG-RELATED REHOSPITALIZATIONS WITHIN SEVEN DAYS: A RETROSPECTIVE STUDY TO IDENTIFY AREAS FOR PHARMACIST INVOLVEMENT IN READMISSION REDUCTION

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Hospital readmissions are increasingly being viewed as a key indicator of health care system performance, and several studies have linked readmissions to drug-related problems.

The primary objective of this retrospective chart review is to quantify and characterize drug-related readmissions (DRRs) at United Hospital. Further objectives are to: (1) identify risk factors for DRRs at United Hospital 2) determine the utility of an Allina Health-developed readmission risk model in identifying patients at risk for DRRs (3) propose modifications to this tool or new tools to risk-stratify patients based DRR risk and (4) propose potential interventions by the pharmacist aimed at reducing avoidable readmissions.

Subjects will be identified for potential inclusion via the Potentially Preventable Readmissions (PPR) Dashboard, a real-time database of potentially avoidable, clinically-related readmissions identified through the application of 3M® PPR software to inpatient data. All seven-day readmissions during a six-month period will be considered for inclusion (approximately 200-230 readmissions). Those deemed to be potentially drug-related after review of the electronic medical record will be classified into various categories including: adverse drug reaction, lack of adherence, drug therapy underutilization, and inappropriate monitoring/follow-up. Baseline characteristics will be collected including age, gender, number of medications, number of chronic conditions, and Allina Readmission Risk Level, and utilized to identify apparent DRR risk factors, propose new tools and interventions that will allow the pharmacist to identify and help prevent DRRs, and ultimately, to improve patient care and demonstrate additional value to the health care team.

Learning Objective:
1.) Recognize the importance of characterizing and measuring hospital readmissions.

Self Assessment:
1.) Hospital Readmissions:
   A. Are increasingly being linked to hospital reimbursement methods.
   B. Reflect high quality clinical care and coordination of care.
   C. May be related to preventable, drug-related problems.
   D. A and C

Q1 Answer: D
The ability of admission medication reconciliation to reduce medication errors and adverse events during hospitalization is well recognized in the healthcare community. The process of medication reconciliation was again highlighted as a National Patient Safety Goal by the Joint Commission in 2014. Recognizing medication reconciliation as an area for improvement, our hospital set out to implement a pharmacy driven medication reconciliation program in order to improve patient safety.

The purpose of this study is to implement a training process for pharmacy driven medication reconciliation utilizing pharmacists and pharmacy interns. A secondary purpose is to objectively measure the success of the program by gathering data from a selection of medication reconciliation encounters. A final purpose is to assess pharmacist, pharmacy intern, and physician attitudes and perceptions regarding medication reconciliation. This will be done to measure changes in perceptions over time, as well as subjectively evaluate the success of the program.

A workflow training document will be created to assist with training pharmacists and interns to complete medication reconciliation. Evaluating success of the pharmacy led process will be accomplished by extracting selected metrics from the hospital’s electronic medical record. Assessing pharmacists’ attitudes and perceptions towards medication reconciliation will be accomplished utilizing a pre and post survey design.

Including pharmacy in the medication reconciliation process has the potential to significantly improve patient safety and decrease adverse events in hospitalized patients. If successful, the results of this research may provide added support for increased pharmacy staffing and expansion of the medication reconciliation program.

**Learning Objectives:**
1. Describe the impact of admission medication reconciliation on patient safety.
2. Recognize the key components and role of the pharmacist/pharmacy intern in the medication reconciliation process.

**Self Assessment Questions:**
1. Which of the following outcomes could be expected when medication reconciliation is completed on patients who are admitted to the hospital?
   - A. Prevention of medication errors
   - B. Reduction in adverse drug events
   - C. Reduced healthcare costs
   - D. All of the above
2. Which of the following steps in the medication reconciliation process is a pharmacist unable to complete?
   - A. Collecting the medication history
   - B. Reconciling the medication list
   - C. Interviewing the patient
   - D. Clarifying the medication list

Q1 Answer: D  Q2 Answer: B

Drug shortages are becoming more frequent, and it is imperative for health systems to have in place procedures for handling them. In 2006, 70 drug shortages were reported compared to the 204 reported in 2012. When developing a plan for handling drug shortages, it is important to maintain focus on the patient, not the situation. To do this, protocols must be in place, and staff must be properly educated. The purpose of this study is to develop a patient-driven delineated approach to managing drug shortages and ultimately, improving the process.

At Wesley Medical Center (WMC) in Wichita, KS, a “plan, do, study, act” (PDSA) cycle was used to develop an approach to handling drug shortages. An initial survey was sent out to physicians, nurses and pharmacy personnel to gauge for areas of improvement. Changes to the current process were developed based upon feedback. Changes were evaluated over a period of five drug shortages to allow for trial and error time. Upon completion of PDSA cycles, the initial survey will be re-sent to physicians, nurses and pharmacy personnel to assess the impact of the changes.

The expected results of the PDSA are an overall improvement in how drug shortages are handled at WMC. Specific areas of focus are communication amongst staff, better retention of previous action plans for recurring shortages and minimizing the necessary FTE allotment. Implementation of the proposed changes is anticipated to result in an ease of burden when new drug shortages arise.

**Learning Objectives:**
1. Review the causes of drug shortages
2. Identify online resources that will aid in verifying drug shortages

**Self Assessment Questions:**
1. Which of the following are reasons for drug shortages?
   - A. Manufacturing problems
   - B. Governmental issues
   - C. Raw material shortages
   - D. Both A and C
2. Online websites to aid in managing drug shortages are:
   - A. FDA
   - B. ASHP
   - C. FAA
   - D. Both A and B

Q1 Answer: D  Q2 Answer: D
Patients with hypertension are at a higher risk for developing coronary artery disease (CAD), heart failure (HF), chronic kidney disease (CKD), stroke, intracerebral hemorrhage (ICH), transient ischemic attack (TIA), peripheral artery disease (PAD), aortic regurgitation, atrial flutter, and mild cognitive impairment. Many studies have shown that an interdisciplinary approach to blood pressure reduction was effective in treating hypertension.

The primary objective of this quality improvement project is to evaluate improvement in blood pressure control and patient's disease state knowledge through a multidisciplinary hypertension shared medical appointment (SMA).

Patients who were unable to meet their blood pressure goal were contacted to participate in the SMA. Blood pressure goals were chosen based on JNC 7 and the VA/Department of Defense guidelines for hypertension. The interdisciplinary team attending the SMA consists of a pharmacist, dietitian, psychologist and nurse educator. Patient education at the SMA consisted of medication information, psychological barriers to blood pressure lowering, proper use of blood pressure machines and appropriate dietary choices. Improvement in blood pressure control was measured from the first SMA attended to the last SMA attended or the patient aligned care team appointment following the patient's last SMA attended. Patient questionnaires were taken by each patient before and after each SMA to evaluate learning and perceived knowledge of each patient.

Data analysis is to be completed in March 2014. Patient questionnaires and blood pressure readings will be evaluated for changes found between initiation of data collection and March 2014.

Learning objectives:
1. Explain the importance of an interdisciplinary approach to treating hypertension.
2. Recall three possible disciplines involved in a hypertension shared medical appointment

Self-Assessment Questions:
1. Untreated hypertension can lead to:
   A. Stroke
   B. Heart attacks
   C. Diabetes
   D. A and B
   E. All of the above

2. Three disciplines involved in the hypertension shared medical appointments include:
   A. Psychologist
   B. Nurses
   C. Pharmacist
   D. A and B
   E. All of the above

Q1 Answer: D  
Q2 Answer: E
Although unfractionated heparin (UFH) has long been one of the primary agents utilized in the treatment of thromboembolic conditions, ideal dosing strategies are still largely debated. The American College of Chest Physicians currently recommends dosing UFH based on actual body weight. The initial dosing recommendation for acute coronary syndrome (ACS) includes a bolus of 70 units/kg (5,000 units maximum) followed by a maintenance infusion of 15 unit/kg/hour (1,000 units/hour maximum). While one must be cognizant of bleeding risks, dose caps may put obese patients at risk for further ischemic events due to prolonged subtherapeutic levels. This dosing dilemma is particularly problematic for health care facilities serving overweight/obese patient populations. In 2012, 29.6% of the state of Missouri was considered obese.

Currently, the University of Missouri Health Care’s ACS (not treated with a fibrinolytic) heparin nomogram follows the CHEST dosing guidelines. Because of the aforementioned concern, the primary purpose of this study is to evaluate the current ACS dosing regimen in our patients.

The research is a single-centered, case-control study with a primary end-point of identifying risk factors for initial subtherapeutic anti-Xa level in a dose capped heparin nomogram. Patients who were greater than or equal to 18 years of age and prescribed the institution’s ACS (no fibrinolytic) heparin nomogram were eligible for inclusion.

Learning Objectives:
1.) Identify variables that may affect blood volume

Self-Assessment Questions:
1.) Which of the following is NOT a variable in the blood volume calculation?
   A. Age
   B. Sex
   C. Height
   D. Weight

Answer: A

PHARMACIST-MANAGED ENOXAPARIN DOSING AND ANTI-XA LEVEL MONITORING FOR THERAPEUTIC ANTOCOAGULATION. Rebecca L. Lange, Matt Kresl, Kelly Moritz, Laura Richardson, and Ashley Feldman. Abbott Northwestern Hospital, Mail Route 11321, 800 E. 28th St, Minneapolis, MN 55407. rebecca.lange@allina.com

Pharmacist-managed enoxaparin therapy at Abbott Northwestern Hospital (ANW) currently includes a dosing tool and routine anti-Xa level monitoring for all patients. The 2013 American College of Chest Physicians (CHEST) guidelines do not recommend routine laboratory monitoring of enoxaparin anticoagulation activity. The guidelines state that anti-Xa level monitoring may be considered in obese patients, patients with renal insufficiency, and during pregnancy. The purpose of this study was to analyze the impact of the routine use of anti-Xa levels to dose and monitor enoxaparin.

A retrospective review was completed of 100 patients who received therapeutic enoxaparin therapy during admission to ANW from June 2013 to November 2013. These patients were separated into two cohorts: patients who received dosing based on the ANW dosing tool using anti-Xa level monitoring and patients who received standard weight-based dosing. Dose adjustments based on levels, time to hospital discharge after initiation, number of levels obtained, and adherence to the ANW dosing tool were assessed.

The development of use criteria for anti-Xa level monitoring for enoxaparin therapy may be warranted pending the results of this study. Identifying specific patient populations appropriate for monitoring may result in a decrease in unnecessary lab draws and improved use of hospital resources.

Learning Objectives:
1.) Describe CHEST guideline recommendations on monitoring anti-Xa levels for therapeutic enoxaparin dosing.

Self-Assessment Questions:
1.) Which of the following statements are correct?
   A. The CHEST guidelines recommend routine monitoring of enoxaparin activity in all patients
   B. There is limited data supporting routine use of anti-Xa monitoring in specific patient populations
   C. Guidelines suggest monitoring may be considered in pregnancy, liver dysfunction, and obesity
   D. Both B and C

Q1 Answer: B
EXPANDING THE ROLE OF A HOSPITAL PHARMACIST: MEDICATION RECONCILIATION IN PHYSICIAN CLINICS: IMPLEMENTING A SERVICE IN 3 PHASES. Adam Wilcox, Christopher Clayton, Allen Hospital, 1825 Logan Ave., Waterloo, IA 50703 adam.wilcox@unitypoint.org

Medication reconciliation is an important piece to patient safety in the hospital setting. Pharmacist-led medication reconciliation has been shown to prevent therapeutic duplications, reduce adverse drug reactions, and reduce the number of hospital readmissions. Due to benefits proven in the hospital setting, pharmacist-led medication reconciliation may soon be expanded to traditional physician offices. Effectively transitioning patients through all phases of care, from a hospital admission, to a primary care physician visit, to seeing a specialist, is imperative to provide the best quality care for every patient. The goal of this study is to determine the benefit of putting an inpatient pharmacist into an outpatient clinic setting to perform medication reconciliation to assist in providing high quality continuous care to patients. This service will be implemented and evaluated through 3 phases: a cost-benefit analysis, trial of the project in family physician offices/data collection, and final analysis/conclusions. At the time this abstract was written, this project was in the data collection phase.

Learning Objectives:
1. Recognize the impact pharmacist-led medication reconciliation can have on patient care

Self-Assessment Questions:
1. Medication reconciliation has been shown to improve patient care by:
   a. Reducing hospital readmissions
   b. Reducing prescriber errors
   c. Reducing the number of adverse drug events
   d. Both A and C

Q1 Answer: D

RETROSPECTIVE REVIEW OF CONCOMITANT ZOSYN/VANCOMYCIN RELATED ACUTE KIDNEY INJURY. Michael Koraleski, Nebraska Methodist Hospital, 8303 Dodge St., Omaha, NE 68114. Mike.Koraleski@nmhs.org

Zosyn and vancomycin are two of the most commonly used intravenous antibiotics to eradicate bacterial infections in the acute inpatient care setting. Recent studies have reported a possible increased risk of acute kidney injury (AKI) when the two agents are used in combination. This study aims to investigate whether there is an increased risk of AKI when Zosyn and vancomycin are used concomitantly.

The study is designed as a retrospective chart review of all patients receiving IV Zosyn and/or IV vancomycin at Nebraska Methodist Hospital during the 4th quarter of 2013. Patients were required to receive more than one dose of IV vancomycin and greater than or equal to 24 hours of IV Zosyn. AKI was defined based on the RIFLE criteria described by the Acute Dialysis Quality Initiative (ADQI) group. Patients were excluded from the study if they had prior end-stage renal disease or if they were admitted with AKI prior to the initiation of antibiotics.

Preliminary results have been obtained for the month of October, 2013. 39 subjects were studied in the concomitant use group. 17 were excluded based on the criteria listed above and four (4) of 22 subjects (18.2%) developed AKI. Data and results of single agent usage, as well as November and December months are currently being collected and analyzed. The completion and statistical analysis of the data collection will be presented at the MPRC in May, 2014.

Learning Objectives:
1.) Review the incidence of acute kidney injury in patients with concomitant use of Zosyn and vancomycin.
2.) Discuss potential risk factors for the development of acute kidney injury.

Self-Assessment Questions:
1.) Based on reports and literature, which of the following scenarios has the most reported incidence of AKI associated with IV vancomycin use?
   a.) elevated vancomycin troughs (20-30mg/L)
   b.) vancomycin therapy where loading doses are administered (25-30mg/kg ABW)
   c.) vancomycin and aminoglycoside concomitant use
   d.) elevated vancomycin peaks (>40mg/L)

2.) The majority of medications that have been associated as a causative agent of acute renal failure (ARF), including antimicrobials, contrast media, and chemotherapy agents, do so via which proposed pathophysiological mechanism?
   a.) prerenal ARF
   b.) intrinsic ARF
   c.) postrenal ARF

Q1 Answer: [c] Q2 Answer: [b]
Medication Therapy Management (MTM) programs are a required element of all Medicare Part D health plans. The results of such mandated MTM programs have been promising, prompting the Centers for Medicare and Medicaid Services to look towards expanding the patient population eligible to receive MTM services. Health plans that are not mandated to have an MTM program are also noticing these positive results and have begun implementing programs of their own. OutcomesMTM, an MTM administration company, has traditionally contracted with Medicare, commercial, and self-funded employer health plans to administer their MTM program. Now they are now bringing their expertise to managed Medicaid plans to address the medication-related problems of this unique patient population.

The purpose of this presentation is to describe the first year of one such managed Medicaid plan’s MTM program. The presentation will begin by looking at the goals of the program and the steps to implementation. Then focus will shift towards the services that were performed, the results of those services, and the measurable data that was obtained. Finally, takeaways and lessons learned will be discussed.

Learning Objectives

1. Describe the MTM program implemented by the managed Medicaid health plan.
2. Report the clinical and economic results from the first year of the MTM program.

Self Assessment Questions:

1. The MTM program described in this session was administered via a(n):
   a. Mailing campaign
   b. Face-to-face pharmacist network
   c. Interactive Voice Response (IVR) system
   d. Internal phone-based team of nurses and nurse practitioners

2. Which MTM service was delivered the most during the first year of the MTM program?
   a. Comprehensive Medication Reviews (CMR)
   b. Prescriber Consultations
   c. Patient Adherence Consultations
   d. Education/Monitoring of a new or changed prescription

Q1 Answer: b Q2 Answer: c

According to a recent study in the American Journal of Medicine by Fischer MA, et al, 24% of patients do not fill their initial prescriptions. This has the potential to impact patient outcomes and readmission rates. Despite continuous efforts to improve patient knowledge and understanding of medications, communication about medications is currently one of the lowest of all Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores at Lawrence Memorial Hospital. Additionally, the discharge information measure at baseline was below the Centers for Medicare and Medicaid (CMS) 95th percentile benchmark and is only at benchmark for this data collection period. Lastly, CMS reduces payment to hospitals with excess readmissions.

In an effort to improve patient care, reduce readmission rates, and improve hospital HCAHPS scores, the pharmacy is proposing the implementation of a bedside delivery service for inpatients, as well as outpatients discharged from the surgery or emergency departments. The primary objective of this study is to estimate the number of patients interested in utilizing this service.

The objective will be assessed through a verbal questionnaire completed by a minimum of 100 patients from inpatient units, outpatient surgery, and the emergency department. The survey will address patient interest, patient satisfaction, and patient expectations of this service. The results of this study will be used to support the implementation of this service with the hospital’s Board of Directors.

Learning Objective:

1) Identify the potential impact of a bedside discharge medication delivery service on patient satisfaction in a community hospital.

Self Assessment Question:

1.) Which of the following survey questions determines patient satisfaction?
   a. How would this service affect your overall understanding of medications?
   b. How would this service influence your decision to use our hospital in the future?
   c. How would this service affect your overall satisfaction with the hospital?
   d. Would you utilize a bedside discharge medication delivery service if it was available?

Q Answer: [C]
Solid organ transplant patients may be at a higher risk for thrombotic complications due to existing co-morbidities and the hypercoagulable state post-surgery. Possible thrombotic events include graft related thromboses and deep vein thromboses, which increases the risk for graft failure, patient morbidity, and mortality. Due to risks for thrombotic events, there may be a role for prophylactic anticoagulation in the immediate post-transplant period.

The purpose of this single-center, retrospective chart review is to describe the rates of thrombotic and hemorrhagic events in kidney and kidney-pancreas patients post-transplant between January 1, 2007 and June 30, 2013 who received peri-operative prophylactic anticoagulation. At Houston Methodist Hospital, post-kidney transplant patients may receive low dose continuous intravenous heparin, subcutaneous heparin, or enoxaparin, while post-kidney-pancreas transplant patients receive low dose continuous intravenous heparin. Data collected for analysis include patient demographics, type of transplant, anticoagulation regimen, documented thrombotic events, and hemorrhagic complications (defined as documented bleeds, hematomas, hemorrhage as seen on pathological or radiographic reports, and/or positive guaiac stool results).

Of the included patients (n=242), 74 received kidney-pancreas transplants and 168 received kidney transplants alone. Baseline demographics of kidney-pancreas recipients are as follows: gender (64% male), mean age of 41 years, race (23% African American, 53% Caucasian, 22% Hispanic). Documented thrombotic events within three days of surgery were identified in 8% (n=6) of the kidney-pancreas transplant patients. Hemorrhagic events through post-operative day three occurred in 11% (n=8) of kidney-pancreas recipients. Additional data analyses and data collection for kidney recipients is currently in progress.

**Learning Objectives:**
1.) Discuss the utility of using prophylactic anticoagulation regimens in post-kidney and kidney-pancreas transplant patients
2.) Describe the use of peri-operative prophylactic anticoagulation strategies in kidney-pancreas and kidney transplant patients at Houston Methodist Hospital

**Self Assessment Questions:**
1.) Prophylactic anticoagulation regimens are an attempt to prevent which of the following thrombotic events in post-kidney-pancreas transplant patients?
   A. Renal vein thromboses  
   B. Renal artery thromboses  
   C. Pancreatic vein thromboses  
   D. Deep vein thromboses  
   E. All of the above
2.) What are the anticoagulation regimens currently utilized at Houston Methodist Hospital to prevent thrombotic events in post-kidney-pancreas transplant patients immediately after surgery?
   A. Subcutaneous heparin  
   B. Intravenous continuous heparin  
   C. Subcutaneous enoxaparin  
   D. None of the above

**Q1 Answer:** E. All of the above  
**Q2 Answer:** B. Intravenous continuous heparin
ADHERENCE TO EARLY GOAL-DIRECTED THERAPY IN THE TREATMENT OF SEVERE SEPSIS AND SEPTIC SHOCK AT A COMMUNITY HOSPITAL. Natalie Johnson, Brooke Bitner, Matthew Lockwood, Malachi Lones Stormont-Vail HealthCare, 1500 SW 10th Ave., Topeka, KS 66604. najohnso@stormontvail.org

To evaluate adherence to early goal-directed therapy (EGDT) in the treatment of severe sepsis and septic shock in three levels of care: emergency room, medical-surgical units, and intensive care units (ICU’s).

In 2013, the International Surviving Sepsis Campaign Guidelines Committee met and updated the Surviving Sepsis Campaign Guidelines for Management of Severe Sepsis and Septic Shock. In 2010, septicemia was the eleventh leading cause of death in the United States. Severe sepsis is defined as having an infection with systemic symptoms of infection and end-organ damage. Septic shock is defined as having sepsis-induced hypotension despite having adequate fluid resuscitation. Through these guidelines, key recommendations were made for early goal-directed therapy (EGDT). This has helped many hospitals establish protocol driven patient care for severe sepsis and septic shock. Time based care bundles have been established to guide therapy.

A retrospective chart review was performed on inpatients over 18, with a diagnosis code of 995.91 (sepsis), 995.92 (severe sepsis) and 785.52 (septic shock). The study period was defined as discharges over a six-month period in 2013. These patients’ charts were reviewed for adequate fluid resuscitation, time from diagnosed sepsis to: lactate drawn, blood cultures drawn, fluids administered, antibiotics ordered, antibiotics verified by pharmacist and time administered by nurse.

The primary objective is mortality in relation to adherence to EGDT measures. Secondary outcomes include time spent in steps of care. The evaluation will be used to identify deficiencies and implement strategies to improve compliance with EGDT.

Learning Objectives:
1. Identify initial resuscitation goals in the management of severe sepsis.
2. Outline educational needs to improve compliance with EGDT.

Self-Assessment Questions:

1. Within the first six hours of resuscitation your patient has a CVP of 9 mm Hg, a MAP of 57 mmHg, urine output of 0.7 mL/kg/hr and a central venous oxygen saturation of 72%. Has the patient met all of the established parameters?
   a. Yes, the patient has met all of the six-hour goals.
   b. No, the patient’s MAP is not at goal.
   c. No, the patient's urine output should be >/= 1 mL/kg/hr.
   d. No, the patient's CVP should be greater than 12 mm Hg.

Q1 Answer: B

EVALUATION OF MEDICATION-INDUCED DELIRIUM IN CRITICAL CARE PATIENTS AT AN ACADEMIC MEDICAL CENTER. Edric Wong, Jace Knutson, Damien Stevens, The University of Kansas Hospital, 3901 Rainbow Blvd, Kansas City, KS 66160. ewong@kumc.edu

The Society of Critical Care Medicine recently released new pain, agitation, and delirium guidelines for intensive care unit (ICU) patients. Delirium has been associated with increased mortality as well as extended lengths of stay in the ICU and overall hospital period. Risk factors for ICU delirium as outlined in the guidelines include: preexisting dementia, history of hypertension and/or alcoholism, and critically ill patients. However, baseline/preexisting conditions are not the only factors affecting increased rates of ICU delirium; therapeutic interventions may also increase the risk of ICU delirium.

The purpose of this study is to determine the rate of medication-induced delirium, to determine if medications used for agitation and sedation contributed to delirium, and to determine whether or not pharmacotherapeutic sleep interventions reduced delirium rates at The University of Kansas Hospital. A medical chart review will be conducted of patients 18 years and older admitted to the medical intensive care unit (MICU) that screened positive for delirium. This study will be submitted to the Human Subjects Committee Institutional Review Board for approval.

Learning Objectives:
1.) Discuss which medications used for pain, agitation, and sedation cause delirium.
2.) Determine whether or not therapeutic sleep agents assisted in decreasing the length of stay in the ICU and overall hospital stay.

Self Assessment Questions:

1.) Should all patients admitted to the medical intensive care unit receive a pharmacologic sleep aid?
2.) Which of the following is NOT a risk factor for ICU delirium per the SCCM Pain, Agitation, and Delirium Guidelines?
3.) Yes, all ICU patients require a form of pain, agitation and delirium therapy.

Q1 Answer:
1) Yes, all ICU patients need sleep to heal.
2) No, medication should not be started in all ICU patients. Some medications may induce delirium
3) Yes, all ICU patients require a form of pain, agitation and delirium therapy.

Q2 Answer:
1) Pre-existing Dementia
2) Diabetes
3) Hypertension
4) Critical Illness
IMPLEMENTATION OF PROCALCITONIN TESTING AND THE EFFECTS ON ANTIBACTERIAL PRESCRIBING PATTERNS IN MEDICAL INTENSIVE CARE UNIT (MICU) PATIENTS.
Samantha Bartusek, Carrie Werner, Minneapolis VA Health Care System, One Veterans Drive, Minneapolis, MN 55417, Samantha.bartusek@va.gov

Unnecessary use of antibiotics in patients leads to increased antibiotic resistance, cost, and adverse effects. Procalcitonin is a biologic marker which has been shown to be a potential indicator of bacterial infections. Levels are detectable in two to four hours and have a half-life of about 24 hours, providing a real time indicator of infection progression. Evaluation of procalcitonin levels may provide guidance in discontinuing antibiotics in patients with suspected bacterial infections. The goal for data collection is to assess whether antibiotic usage in the MICU decreased with utilization of procalcitonin labs.

Serial procalcitonin levels were obtained for MICU patients suspected of having a bacterial infection who were initiated on antibiotics. An algorithm for interpretation of procalcitonin levels was provided to guide decisions regarding antimicrobial therapy. Patients excluded from this project include: patients with a proven bacterial infection, patients not suspected of a bacterial infection, patients receiving antibiotics for 24 hours prior to procalcitonin lab draw, and patients with conditions known to cause elevated procalcitonin levels. Data was collected for six months prospectively and six months retrospectively from implementation of procalcitonin monitoring.

Primary outcomes included total days of patient antibiotic exposure per 1000 patient days and patient MICU length of stay. Secondary outcomes included patient hospital length of stay, number of antibiotics per day of antibiotic exposure, antibiotic usage per antibiotic class, proportion of patients with a diagnosis of sepsis in whom procalcitonin levels were monitored, mean number of procalcitonin levels per patient, and utilization of the provided algorithm.

Learning Objectives:
1) Evaluate the potential for utilization of procalcitonin labs to reduce antimicrobial usage
2) Discuss the limitations of procalcitonin labs

Self-assessment Questions:
1) Within what timeframe will procalcitonin levels peak after stimulus by infection?
2) In what non-infectious conditions might procalcitonin levels be elevated?

Q1 Answer: Levels are detectable within 2 to 4 hours and peak within 6 to 24 hours

Q2 Answer: Procalcitonin may be elevated with systemic stress or inflammation (trauma, cardiac shock, burns, major surgery), multiorgan failure, medullary thyroid carcinoma, calcitonin-secreting pancreatic tumors, and acute graft vs host disease.

EVALUATION OF ANTIMICROBIAL STEWARDSHIP IN AN ACADEMIC MEDICAL CENTER EMERGENCY DEPARTMENT.
Barry Nakaoka, Jennifer Anthone, Krysta Baack, Wesley Grigsby, Creighton University Medical Center, 601 N 30th St., Inpatient Pharmacy, Omaha, NE 68131. BDN78084@creighton.edu

Antimicrobial treatment of patients being discharged from the emergency department (ED) presents unique challenges for clinicians. Current available literature supports the importance of timely follow-up and appropriate antimicrobial selection. As a result, some ED’s have chosen to utilize antimicrobial stewardship programs (ASP’s) to help with this process.

The purpose of this pre-test/post-test quality assurance project is to assess the effectiveness of transitioning the culture-review responsibility from the ED Physician Assistant (PA) to a pharmacist at our institution. The primary objectives are to determine the percentage of ED patients receiving empiric antimicrobial therapy that warrants modification after culture results are reported and the percentage of patients in which an attempt was made to contact the patient and/or PCP for follow-up.

All patients with positive culture results after being discharged home from the ED will be included for review and assessed for appropriateness of empiric antimicrobial regimen. Appropriateness will be based upon the culture/sensitivity results, current evidence based practice guidelines, and patient-specific laboratory information. If a patient is determined to have received inappropriate empiric antimicrobial therapy, an attempt will be made to contact the patient and to correct therapy. Baseline observational data will be collected for the pre-intervention PA-management process and then compared with the post-intervention pharmacy-management process for defined objectives.

Pharmacist management of antimicrobial stewardship in patients discharged from CUMC’s ED should have a positive impact on the overall quality of care of these patients and decrease ED provider workload. Results will be used to help justify a pharmacist-driven ED ASP.

Learning Objectives:
1.) Discuss the potential impact of a pharmacy driven antimicrobial stewardship program in an Emergency Department.

Self Assessment Questions:
1.) Which of the following statements is correct regarding the potential impact of a pharmacy-run Emergency Department culture review and follow-up process?
A. Reduced patient follow-up attempts
B. Decreased patient counseling
C. Receipt of appropriate antibiotic therapy in a more timely fashion
D. Lack of financial assistance for patients

Q1 Answer: C
Vancomycin is a bactericidal glycopeptide antibiotic utilized in the treatment of severe gram-positive infections which requires individualized dosing to achieve the recommended target concentrations. Actual body weight has been shown to predict vancomycin clearance and to be the optimal method for achieving target trough concentrations. In February 2012, Via Christi Hospitals initiated a consult-based dosing service through which pharmacists manage all aspects of vancomycin dosing and monitoring. The purpose of this study is to evaluate the frequency with which vancomycin is initiated at a dose of at least 15 milligrams per kilogram actual body weight as recommended by the 2009 ASHP, IDSA, and SIDP consensus review, when dosed by pharmacy dosing service providers versus non-pharmacy dosing service providers. Secondary endpoints of this study include evaluation of the number of vancomycin concentrations obtained per days of therapy, frequency of therapeutic vancomycin trough concentrations, and frequency of nephrotoxicity.

This retrospective chart review was approved by the Institutional Review Board prior to initiation. Patients age 18 and older who receive intravenous vancomycin therapy for at least 48 hours were included for data collection, with the first 13 dosing service and non-dosing service patients of each month selected for a total of 156 patients per group. Initial vancomycin doses will be evaluated to determine if the dose equals at least 15 milligrams per kilogram actual body weight.

The results of the study will be used for education and promotion of optimal vancomycin dosing and to assess the performance of the pharmacy dosing service.

**Learning Objective:**
1. Describe vancomycin pharmacokinetic parameters

**Self Assessment Question:**
1. Which of the following statements is correct?
   A. The optimal pharmacokinetic model for vancomycin is concentration-dependent
   B. Vancomycin trough concentrations less than 10 mg/mL have been associated with an increase in MIC
   C. Vancomycin trough concentrations of 5-15 mg/mL correlate with an AUC\textsubscript{0-24}\textsubscript{MIC} of ≤ 400 mcg\textsubscript{h}/mL
   D. An increasing number of Staphylococcus aureus isolates with vancomycin MICs ≤ 4 mg/L are responsive to vancomycin therapy

**Answer:** B

**Learning Objectives:**
1.) Review the impact of avoiding beta-lactams in patients labeled penicillin allergic.
2.) Report tolerability of cephalosporins and carbapenems in this patient population.

**Self Assessment Questions:**
1.) Impacts of avoiding beta-lactams in patients labeled penicillin allergic include:
   A. The use of more expensive antibiotics.
   B. Choosing antibiotics with less efficacy.
   C. Decreasing antibiotic resistance.
   D. Both A and B

2.) The cross-reactivity of cephalosporins and carbapenems in patients labeled penicillin allergic is:
   A. Much higher than historically feared.
   B. Occurs in approximately 10% of penicillin allergic patients.
   C. Much lower than originally reported.
   D. Both A and B

**Q1 Answer: D  Q2 Answer: C**
Medication adherence is a significant barrier to improving patient health outcomes and preventing long term complications from chronic diseases. This is a problem which community pharmacists are uniquely able to impact. One approach to improving medication adherence that is gaining popularity is medication synchronization. These programs help patients keep their medications more organized and decrease the burden of remembering to refill medications. This study seeks to evaluate the effects of such a program on medication adherence in the setting of a small, rural pharmacy.

This program was conducted at Liebe Drug in Milbank, SD. Patients that were enrolled had filled prescriptions at the pharmacy for at least 3 months prior to enrollment. Patients’ medications were synchronized to be filled every 30 days on the same date. Every month thereafter, the patient was called by a pharmacist a week before their next refill day. The pharmacist obtained authorization from the patient to refill medications and assessed if the patient had any changes in their medication regimen. Prescribers were then contacted for refills and medication changes if necessary. A patient’s medication adherence was measured for approximately 3 months from the patient’s first medication refill date to the patient’s 4th refill date. This was then compared to the patient’s previous medication adherence taken from 3 refills prior to enrollment in the program. At this time, data is still being collected and analyzed. The conclusions from this study may help determine if medication synchronization programs are helpful tools in improving medication adherence.

**Learning Objectives:**
1. Describe the key aspects of the medication synchronization program used in this study.
2. Describe how a medication synchronization program might help improve medication adherence.

**Self-Assessment Questions:**

1. Which of the following is NOT a key aspect of the medication synchronization program used in this study?
   a. Monthly follow-up with a pharmacist
   b. Synchronizing patient’s medications to be filled at the same time of the month
   c. Identifying patients at risk for medication non-adherence and providing extra counseling
   d. Contacting physicians for medication refills before the patient needs the medication

2. Which of the following is a way that medication synchronization might help improve medication adherence?
   a. Relieving the patient of having to call in their medication refills every month will facilitate the patient’s compliance with medication therapy.
   b. Decreasing medication costs could encourage patients not to skip their medications to save money
   c. Extended counseling on medication adherence could help patients better understand how to take their medication effectively
   d. Delivering patient medications could help patients by relieving them of having to pick up their medications at the pharmacy.

**Answers:** Question 1: C  Question 2: A

**IMPLEMENTATION AND EFFICACY OF A PHARMACIST BASED LIFESTYLE COACHING PROGRAM.** Laura Johnson, Jodi Heins, Vince Reilly, South Dakota State University and Medicap Pharmacy, Box 2202C, Brookings SD 57007. lbjohnson5939@gmail.com

Weight loss, a healthy diet, and regular physical activity all play a vital role in prevention and control of chronic disease. Treatment guidelines for hypertension, dyslipidemia, diabetes, and metabolic syndrome all include lifestyle modifications as either the primary treatment or an adjunct to medication therapy. However, many patients do not receive adequate counseling and monitoring to effectively begin and maintain making lifestyle modifications.

This study aimed to evaluate the implementation and efficacy of an eight-week pharmacist based lifestyle-coaching program on clinical disease indicators and patient satisfaction. Current treatment guidelines for hypertension, dyslipidemia, diabetes, obesity, and metabolic syndrome provided the information used for the education. Patients without a chronic disease received information from the dietary and physical activity guidelines for Americans. Assessment of patient satisfaction occurred at the end of the program.

The study assessed the primary objectives through a patient screening that included weight, body mass index, waist circumference, fasting lipid panel, blood pressure, hemoglobin A1C, and fasting blood glucose. Patients repeated the screening at the end of the study to look for clinical improvements. An anonymous patient survey administered at the end of the program measured patient satisfaction.

The results of the study showed that the pharmacist based lifestyle-coaching program led to small improvements in the clinical disease indicators and an overall positive response from the study participants regarding the education received. Further analysis is required to determine the overall costs and financial viability of continuing the program at the practice site.

**Learning Objectives**
1. Identify the need for lifestyle modifications in the control of chronic disease.
2. Review the clinical and patient satisfaction results of a pharmacist based lifestyle-coaching program.

**Self-Assessment Questions**

1. Which of the following statements is correct
   a. Weight loss, sodium reduction, and exercise recommended in the treatment of hypertension
   b. Dietary fat reduction is recommended for patients with dyslipidemia
   c. A carbohydrate free diet is recommended for management of diabetes and pre-diabetes
   d. Both A and B

2. The pharmacist based lifestyle coaching program showed:
   a. Decrease in systolic blood pressure for >75% of patients
   b. Decrease in fasting blood glucose for >75% of patients
   c. Decrease in LDL-cholesterol for >75% of patients
   d. Decrease in weight for >75% of patients

Q1 Answer: D  Q2 Answer: A
THE IMPACT OF TRANSLATIONAL SERVICES IN A COMMUNITY PHARMACY SETTING ON PATIENT SATISFACTION OF PHARMACY SERVICES AND MEDICATION ADHERENCE. Trenton Powell, Laura Klug, Charles Doan, Mallory McKenzie, Yongyue Qi, Creighton University School of Pharmacy & Health Professions, 2500 California Plaza, Omaha, NE 68178.
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Cultural barriers to health care are a major issue affecting the health of ethnic minority groups. According to a report by the Institute of Medicine in 2003, disparities in health outcomes exist among minorities even when controlled for insurance status, income, and education. Language barriers often play a significant role in these disparities as they can weaken communication between patient and provider, reduce patient access to health care, and prevent health care professionals from providing optimal treatment to patients.

The purpose of this study is to assess adherence and patient satisfaction in refugee patients filling prescriptions at retail pharmacies.

This study will evaluate medication adherence rates between patients who use traditional retail pharmacies without our language needs and those who use a pharmacy equipped with translation services. The participants included in this study are patients served by the Alegent Creighton Florence Residency Clinic whose primary language is Karen, Burmese, Chin or Nepali. The Alegent Creighton Florence Clinic Pharmacy has implemented phone interpretation services and will print prescription directions in the patient’s native language to assist with understanding regimens. Medication adherence and pharmacy patient satisfaction surveys will be self-completed by the participants in the primary care clinic at follow-up appointments. The surveys will be analyzed by outside companies which will provide detailed reports of these surveys.

The results of this study will be used to recommend appropriate pharmacy services to new refugee patients at the Alegent Creighton Florence Residency Clinic.

Learning Objectives:
1.) Describe how language barriers can effect health care

Self Assessment Question
1.) Language barriers can effect health care by:
   a. Preventing health care professionals from providing optimal treatment to patients
   b. Reducing patient access to health care
   c. Weakening communication between patients and providers
   d. All of the above

Q1 Answer: d

SURVEY TO DETERMINE PHARMACISTS’ CAPABILITIES AND PERCEIVED VALUE OF CLINICAL INTERVENTIONS DURING THE DISPENSING PROCESS. Wendy Lantaff, Stevie Veach, Randy McDonough, Julie Urmie. Towncrest Pharmacy, 2306 Muscatine Avenue, Iowa City, Iowa 52240.
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The purpose of this study is to examine the perceived financial and clinical value community pharmacists in a Midwestern state place on clinical interventions that occur during the medication dispensing process and to determine what factors may influence pharmacists’ abilities to address clinical interventions in the traditional community setting.

Interventions made by pharmacists in the community setting are associated with an overall cost savings to the health system in addition to improved patient outcomes. These necessary interventions add an incremental cost to the dispensing process which is generally not accounted for in current reimbursement model. Beyond the cost burden during the dispensing process, further evaluation is also needed to determine the pharmacists’ capabilities in making these interventions, beyond those needed to properly dispense the prescription, due to influencers such as knowledge/skill, training, and work environment. An online survey to evaluate these objectives has been developed and will be administered through Qualtrics. A link to access the survey will be emailed to the study population with a cover letter explaining the purpose of the study. The email will be sent through the state pharmacy association’s list server to pharmacists who practice within the state and who identify their practice site as the community pharmacy setting. The online survey will be open from December 2013 to February 2014. Following the closing of the survey data analysis will occur and descriptive statistics will be used to summarize the survey results.

Results pending completion of data collection.

Learning Objective(s):
1.) Identify the most common obstacles pharmacists in the community setting may encounter when making clinical interventions during the traditional dispensing process.

Self Assessment Question(s):
3.) Based on the data collected, which of the following statements is most accurate?
   a. Common obstacles pharmacists may encounter when making clinical interventions during the dispensing process include time, staffing and lack of physician data.
   b. The most common obstacle cited by pharmacists when making clinical interventions during the dispensing process is personal knowledge deficiencies.
   c. Pharmacists believe that additional reimbursement should not be paid for clinical interventions made during the dispensing process.

Q1 Answer: a
OPTIMIZATION OF MEDICATION DISTRIBUTION PROCESSES AND WORKFLOW IN AN URBAN, ACUTE CARE HOSPITAL. Nicholas Gamble, Rachel Root. Abbott Northwestern Hospital 800 E. 28th Street – MR 11321, Minneapolis, MN 55407-3799. Nicholas.gamble@allina.com

To assess the turnaround time of the current medication distribution processes in place for pending, picking and delivering new medications to automated dispensing cabinets (ADCs), and to reduce the time it takes to load new medications into the ADCs thereby improving patient care, improving pharmacist and nursing satisfaction, and reducing the workload of all parties involved (pharmacists, technicians, and nurses).

It has been a concern at Abbott Northwestern that it currently takes extended periods of time to deliver new medications to patient care areas. This negatively impacts the workflow of nursing, pharmacists and technicians alike, all while decreasing patient satisfaction as medications are not available for immediate use when required. Preliminary observational data suggests that loading a new medication into an ADC can take up to five hours, and in worst case scenarios, nearly 24 hours. It should be noted that the current goal time is two hours or less. Using Lean concepts, this study aims to decrease the turnaround time of new medication loads to patient care areas throughout the hospital.

Using direct observational methods, times studies of the pending, picking, and delivering process will be acquired at baseline. Once a baseline has been established, Lean concepts will be applied and a 2-day Kaizen event will held in order to “try storm” ideas for optimizing current processes. Following this event, changes will be implemented into the process and new time studies will be conducted to determine if these improvements had a positive impact on workflow and turnaround time.

Learning Objectives:
1. Describe how Lean process improvement can positively impact a healthcare facility, specifically as it relates to pharmacy operations and the medication distribution process

Self-Assessment Questions:
1. All of the following activities are important in assessing a process using Lean concepts, except:
   a. Value stream mapping
   b. Spaghetti diagrams
   c. Waste walks
   d. “A Day in the Life” charting

Q1 Answer: D

IMPROVING POST-SURGICAL PATIENT SATISFACTION THROUGH PRE-SURGICAL, PHARMACIST-LED PAIN MANAGEMENT EDUCATION Jon Malepsy, Maria Zarambo, Abbott Northwestern Hospital, 800 East 28th Street, Minneapolis, MN 55407 jon.malepsy@allina.com

Management of pain following surgery is a significant challenge. At our practice site, controlling pain in the spine/joint replacement surgical population has been particularly challenging, with pain-related patient satisfaction scores routinely falling below those of other patient populations. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is a questionnaire distributed by acute care hospitals to most patients once they have discharged. The results of this survey are publicly reported and two of the items inquire about the patient’s satisfaction with pain control during their visit.

The purpose of this study will be to evaluate pain-related patient satisfaction scores in the post-spine and post-joint replacement surgical populations as measured by a comparison of HCAHPS responses in a group of patients who receive pre-surgical, pharmacist-led pain education to those who do not.

Patient pain education will be carried out in a group of patients randomly selected from a larger group of pre-spine and pre-joint replacement surgical patients who have attended a pre-surgery class. The patients in the intervention group will be called 1-2 days before their surgeries and given a ten minute presentation on post-surgical pain management. Post-surgical data will then be collected by chart review and the intervention group will be compared to the non-intervention group.

With the thought that repetition of information will help patients with retention, and that patient knowledge and awareness will assuage anxiety, fear and pain, we believe that a pre-surgical, pharmacist-driven patient education initiative surrounding pain management will improve post-surgical patient satisfaction.

Learning Objectives:
1.) Understand and be able to replicate a model for improving post-surgical patient satisfaction through pharmacist-driven pain education.

Self-Assessment Questions:
1.) The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey is:
   a. Used only as tool for internal hospital improvement
   b. Utilized as a public reporting tool
   c. Primarily focused on patient satisfaction as it relates to pain management
   d. Administered to only 20% of hospitalized patients

Q1 Answer: b
Medication reconciliation is an essential component of pharmacy practice that enhances therapeutic relationships with patients, improves transitions of care, prevents readmissions, and mitigates medication errors. Gathering a complete medication history is challenging and unintended medication discrepancies may occur during admission. The Joint Commission developed a National Patient Safety Goal (NPSG.03.06.01) to reduce medication discrepancies and improve patient outcomes across the continuum of care. The goal entails comparing and aligning outpatient and inpatient medication orders, resolving discrepancies, and educating patients about their medications.

The primary objective of implementing this program is to involve pharmacists in the admission medication reconciliation process to improve patient safety at Unity Hospital. A secondary objective will involve strengthening the interdisciplinary relationship and communication between pharmacists, nurses, and providers. A tertiary objective will focus on expanding the role of medication reconciliation through pharmacy interns in the emergency department.

All pharmacists and pharmacy interns completing medication reconciliation will receive one-on-one education and training on specific techniques for conducting a patient interview and how to document a complete and accurate medication list to ensure proficiency and consistency. Biweekly interdisciplinary meetings will be held to discuss admission medication reconciliation issues, review processes, develop a pharmacy staffing model for medication reconciliation work, and identify areas for advancement. Metrics will be conducted to analyze the number of medications reviewed, the amount of time spent, and the number discrepancies identified. We expect that admission medication reconciliation completed by pharmacists will be more accurate and enhance patient safety at Unity Hospital.

**Learning Objective:**

1. Describe the importance of pharmacy-driven medication reconciliation in aligning with the Joint Commission National Patient Safety Goal (NPSG.03.06.01).

**Self-Assessment Question:**

1. The Joint Commission NPSG.03.06.01 does not focus on:
   
   A) Educating patients about their medications
   B) Adding medications recommended in the guidelines
   C) Resolving medication discrepancies
   D) Aligning outpatient and inpatient medications

**Q1 Answer:** B

**Learning Objective:**

1. Identify possible responsibilities which can expand a pharmacists’ role and reduce hospital readmissions

**Self-Assessment Questions:**

1. Future responsibilities for pharmacists could include:
   
   A. Conducting discharge medication reconciliation
   B. Prescribe additional inhalers if needed
   C. Conduct follow-up phone calls to patients to assess medication compliance
   D. Both A and C

**Q1 Answer:** D
Vitamin K antagonists are widely used for oral anticoagulation, but their narrow therapeutic window necessitates close monitoring. There have been multiple studies conducted to determine which management method optimizes outcomes for patients, but few have studied the effects of patients managed by point-of-care (POC) face-to-face visits vs. patients managed by lab draw with telephone follow-up.

The objective of this study is to compare outcomes for patients anticoagulated with warfarin that are managed via POC face-to-face visits vs. patients managed by lab draw with telephone follow-up.

Our population includes patients taking warfarin that are followed at our outpatient anticoagulation clinic. We used retrospective chart-review to gather necessary data found within the electronic medical record. The primary endpoint is time in therapeutic range (TTR) which will be approximated by analyzing INR values using the method developed by Rosendaal et al. The secondary endpoints include thromboembolic and bleeding event rates which were identified using ICD9 codes, and occurrences of INR values <1.5 or >5 documented within the electronic medical record during the study time period.

The goal of this study is to identify if there is a difference in patient outcomes in regards to TTR, bleeding and thromboembolic events, and occurrence of INR values <1.5 or >5 when comparing two different management services. The results of this study will help to identify which service offers better patient outcomes which may lead to a change to our current practice model.

Learning Objectives
1) Identify the advantages and disadvantages of using the face-to-face point-of-care method of warfarin management vs. lab draw with telephone follow up.

Self-Assessment Questions
1) Which of the following is a disadvantage of managing warfarin patients using lab draw with telephone follow up?
A. The lab test requires less blood than the POC test
B. There can be difficulty reaching the patient to communicate the warfarin dose
C. The patient has the freedom to fit the INR draw around their schedule
D. The lab draw requires an XL needle

Answer: B There can be difficulty reaching the patient to communicate the warfarin dose.

PROSPECTIVE PHARMACIST IDENTIFICATION OF DRUG THERAPY PROBLEMS IN THE MEDICAL HOME.
Tamara S. Lallier and James D. Hoehns. Northeast Iowa Medical Education Foundation, 2055 Kimball Ave, Waterloo, IA 50702. tlallier@neimef.org

Medication management is an essential component of the care plan for patients in the Patient Centered Medical Home (PCMH). Pharmacists are best equipped to take on this role, as no other discipline has equivalent training in medication optimization. While there is widespread interest in developing new pharmacist care models in the ambulatory care setting, the role of pharmacists in the PCMH is still being developed. Few ambulatory clinics provide routine prospective pharmacist review of a patient’s medication regimen. A previous pilot study at Northeast Iowa Family Practice Center (NEIFPC) established a system for the pharmacist to inform providers of patient drug therapy problems via the electronic health record prior to their scheduled clinic appointment. The next phase was to further refine and implement this pharmacist care process at NEIFPC and to assess its usefulness.

The objective of this study was to implement and expand a systematic process for pharmacists to provide prospective chart review and make drug therapy recommendations to healthcare team members in the PCMH. The study will use a quality improvement design that incorporates prospective chart review, attendance at pre-visit team huddles, and select face-to-face encounters in high-risk patients. Measures evaluated will include: percentage of patient charts prospectively reviewed, number of face-to-face encounters, number of recommendations made, and their acceptance rate. Given current limitations for pharmacist reimbursement, pharmacists may need to expand the pool of ambulatory patients they provide services to. We believe this is a pharmacist care model which could readily be adapted to other medical homes.

Learning Objectives:
1) Outline a feasible process for pharmacist involvement in pre-visit planning

Self Assessment Questions:
1) Which of the following is a feasible way to improve pharmacist involvement in pre-visit planning in the medical home?
   a. Conduct a medication review with every patient who comes to the clinic
   b. Identify drug therapy problems, but do not inform the provider
   c. Prospective chart review, including identification of drug therapy problems, and informing the provider prior to the patient visit
   d. Avoid pre-visit huddles

Q1 Answer: C
PATIENT SATISFACTION WITH PHARMACIST-LED CHRONIC DISEASE STATE MANAGEMENT PROGRAMS. Tyler Schuessler, Janelle Ruisinger, Sarah Hare, Brittany Melton, Hen House Pharmacy, 13600 S. Blackbob Rd, Olathe, KS 66062.

Prior studies have shown that pharmacist involvement in disease state management (DSM) leads to improved clinical outcomes and reduced costs. As patient participation in pharmacist-led DSM programs increases, assessing and understanding patient satisfaction will be imperative for program success.

This study assessed patient satisfaction with pharmacist-led diabetes and cardiovascular DSM programs. Launched in 2008, the program is administered by a self-insured chain of grocery store pharmacies in the Kansas City metropolitan area. Eligible employees and dependents utilizing company health insurance are given incentives to participate in the DSM programs, including discounts on health insurance and medications.

A printed survey collected demographic information and assessed patient satisfaction with the DSM programs through a modified version of the validated Diabetes Disease State Management Questionnaire using a 5-point Likert Scale. Surveys were distributed over three months by clinical pharmacists and anonymously completed by program participants, who were required to be ≥ 18 years old, to be an employee or dependent utilizing company health insurance, to have participated in the DSM programs for ≥ six months, and have either hypertension, hyperlipidemia, and/or diabetes.

Out of 313 eligible patients, 128 completed surveys. Some patients who spoke English as a second language, lacked an appointment during survey distribution, or declined the survey were omitted. Data analysis is ongoing. Descriptive statistics will be used to assess patient demographics. Program perception and satisfaction will be evaluated using chi-square (p ≤ 0.05). Results from this study could influence future consideration for starting, continuing, or improving pharmacist-led DSM programs.

Learning Objectives:
1. Identify how patient perceptions could impact pharmacist-led DSM programs.

Self-Assessment Questions:
1. Understanding patient satisfaction and perceptions could lead to:
   A. Modification of a current DSM program
   B. Improved patient care
   C. Poor communication between patient and provider
   D. Both A and B

Q1 Answer: D

Learning Objectives:
1) Describe the availability of patient-assistance programs in the outpatient infusion population
2) Describe the impact of patient-assistance programs in the outpatient infusion population

Self-Assessment Question:
1) Patient-assistance for outpatient infusion medications are:
   a. Provided through manufacturer-sponsored programs
   b. Provided through third-party programs and government programs
   c. Difficult to find and tedious to enroll patients in
   d. A and B

2) Patient-assistance programs:
   a. Routinely use patient contact information to advertise medication the patient is not currently taking
   b. Assist patients with deductibles, copayments, and coinsurance that their healthcare insurance did not cover
   c. Are unavailable to patients whose income is above the federal poverty level.
   d. B and C

Q1 Answer: D Q2 Answer: B

To determine overall cost-savings following systematic, proactive enrollment of eligible patients into co-pay assistance and drug-replacement programs.

A system to proactively identify and enroll eligible patients into manufacturer-sponsored assistance programs was designed and implemented in an outpatient infusion center. Trastuzumab, pegfilgrastim, filgrastim, bevacizumab, and denosumab were identified as frequently used, high-cost medications within the infusion center. A patient-assistance program for each drug was selected based on ease of enrollment and anticipated reimbursement. Screening was completed daily for patients presenting to the infusion center. If a patient was to receive trastuzumab, pegfilgrastim, filgrastim, bevacizumab, or denosumab and held private insurance, they were approached by a pharmacist to further screen for program eligibility. Patients meeting all program requirements were enrolled by a pharmacy staff member upon permission by the patient.

Thirty-three patients were enrolled from 12/19/2013 to 1/20/2014. Claims were submitted for patients with outstanding copays or deductibles resulting from infusions that occurred between 1/3/2014 and 2/5/2014. Primary endpoints include the number of eligible patients, total facility savings, total patient out-of-pocket savings, and average savings per patient.
Patients undergoing induction chemotherapy for acute leukemia will develop prolonged neutropenia, clinically defined as absolute neutrophil count (ANC) <500 cells/mm³ for >7-10 days, and are at high risk for infectious complications. A primary supportive care measure for patients undergoing induction chemotherapy is to initiate antiviral, antifungal, and potentially antibacterial and anti-\textit{Pneumocystis} prophylaxis. When to start and stop these medications is not clearly defined. Even with use of prophylactic agents, it is common for these patients to develop neutropenic fevers. Guidelines suggest continuing treatment for neutropenic fevers of unknown origin until defervescence and signs of marrow recovery. With this criteria met, preparing patients for discharge may be complicated by the lack of recommendations guiding ANC to be achieved prior to discharge.

The purpose of this study is to determine if anti-infective prophylaxis is started and stopped appropriately in alignment with national guidelines. Additional objectives are to determine if antibiotics started in patients who develop neutropenic fevers of unknown origin are stopped according to guideline criteria and to identify what ANC might be acceptable for hospital discharge.

These objectives will be assessed in a retrospective chart review of patients undergoing induction chemotherapy January 2011-July 2013. Statistics will be evaluated using Excel. The results of the study will be used to implement standardization in the supportive care for patients with acute leukemia admitted to the hospital.

### Learning Objectives:

1.) Discuss anti-infective prophylaxis for patients with acute leukemia undergoing induction chemotherapy.

2.) Review when antibiotics for neutropenic fevers of unknown origin should be discontinued.

### Self Assessment Questions:

1.) Patients with acute myeloid leukemia undergoing induction chemotherapy should be started on:
   a. Acyclovir only as soon as possible
   b. Amphotericin B and sulfamethoxazole/trimethoprim on day 2 of induction chemotherapy
   c. Acyclovir and posaconazole on or before day 1 of induction chemotherapy

2.) National guidelines suggest antibiotics for neutropenic fevers of unknown origin can be discontinued when:
   a. patients are afebrile and ANC >1500 cells/mm³
   b. patients are afebrile and ANC >500 cells/mm³
   c. the ANC >2000 cells/mm³
   d. patients no longer have a fever

Q1 Answer: D  Q2 Answer: B

### Learning Objective: To review the role of fluoroquinolone prophylaxis in acute leukemia patients undergoing induction therapy.

### Self-Assessment Question: Fluoroquinolones are recommended for prophylaxis in acute leukemia patients undergoing induction therapy because:

(a) The fluoroquinolones have a narrow spectrum of activity.
(b) The fluoroquinolones have not been associated with \textit{Clostridium difficile}-associated diarrhea.
(c) Fluoroquinolone prophylaxis may reduce mortality in neutropenic patients.
(d) This patient population does not experience prolonged neutropenia.

Answer: C

Acute leukemia patients undergoing induction therapy are at increased risk of developing infections from prolonged neutropenia. Life-threatening infections arise from longer and more severe neutropenia that results from increased intensity induction chemotherapy. Fluoroquinolones given for bacterial prophylaxis decrease the risk of febrile neutropenia and infection-related mortality. Most published data describe outcomes with levofloxacin and ciprofloxacin, whereas little published information exists regarding the use of moxifloxacin as prophylaxis in the neutropenic population. The purpose of this retrospective cohort study is to report our institution’s experience with moxifloxacin when used as prophylaxis in the acute leukemia population.

Adult patients who received moxifloxacin after induction chemotherapy for acute leukemia from 2005-2010 were retrospectively identified through ICD9 codes. The primary endpoint was the incidence of febrile neutropenia. Secondary endpoints included the incidence of \textit{Clostridium difficile}-associated disease (CDAD) and antibiotic susceptibility of isolated pathogens from breakthrough infections.

The results of this study will provide data on the effectiveness of moxifloxacin prophylaxis in the acute leukemia population. Furthermore, this study will provide evidence on breakthrough infections and incidence of CDAD in patients receiving moxifloxacin prophylaxis.
Patients with acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) routinely undergo induction chemotherapy with 7+3 or HyperCVAD, respectively. As a result, patients are commonly neutropenic for prolonged periods of time. Despite approaches to reduce infection rates, patients frequently develop neutropenic fever and require antimicrobials. Empiric therapy with a broad-spectrum anti-pseudomonal agent is recommended for neutropenic fever. Empiric gram-positive coverage with agents such as vancomycin or linezolid is only recommended with certain clinical criteria. Linezolid may be considered where vancomycin-resistant organisms are suspected or vancomycin isn’t an option. Linezolid use poses the risk of hematologic adverse effects; however, the evidence in oncology is limited. A study in febrile neutropenia demonstrated, via post-hoc analysis, that time to neutrophil recovery was longer with linezolid compared to vancomycin. Given the limited evidence, further studies primarily assessing hematologic adverse effects of linezolid in hematologic malignancies are needed.

This is a retrospective, observational study designed to assess linezolid use and hematologic outcomes in acute leukemia following induction chemotherapy. Patients ≥18 years admitted December 2010-2013 with newly diagnosed AML or ALL will be assessed for inclusion. Patients with at least 72 hours of extended gram positive therapy will be grouped into two arms, Arm A (linezolid + gram-negative antimicrobial) and Arm B (vancomycin or daptomycin + gram-negative antimicrobial). The primary endpoint is time to neutrophil recovery. Secondary endpoints include: platelet count at time of neutrophil recovery, duration of gram-positive therapy, and length of hospital stay. Outcomes remain under investigation; data collection and analysis are ongoing.

**Objective:** Describe potential adverse effects associated with linezolid in patients with hematologic malignancies.

**Self-Assessment:** What is NOT a potential concern regarding the use of linezolid for febrile neutropenia in patients receiving induction chemotherapy?

A: Thrombocytopenia  
B: Thrombocytosis  
C: Neutropenia  
D: Delayed count recovery  

**Answer:** B
Specialty pharmaceuticals are defined as high cost medications that treat rare conditions, require special handling, use a limited distribution network, or require ongoing clinical assessment and patient education. Specialty pharmacy is a unique pharmacy service that provides a comprehensive and coordinated model of care. In 2012, specialty medications accounted for approximately 25% of the total prescription drug expenditure, although they were less than 1% of the total prescriptions filled. It is projected that the specialty market will account for 50% of the total prescription drug expenditure by 2018 and medications for inflammatory conditions, multiple sclerosis, and cancer are expected to account for greater than 50% of that overall expenditure.

A three-phase retrospective analysis of multiple myeloma patients will be conducted. The first phase of the study will include multiple myeloma patients treated at UIHC prior to specialty pharmacy services and a Clinical Pharmacy Specialist in the Multiple Myeloma Program. The second phase will include patients treated at UIHC with access to a Clinical Pharmacy Specialist, but no formal specialty pharmacy services. In the final phase, multiple myeloma patients will be evaluated after the implementation of formal specialty pharmacy services and Clinical Pharmacy Specialist education and training.

The purpose of this study is to evaluate the length of time patients are on medication for multiple myeloma, medication adverse events, pharmacist clinical interventions, patient readmissions, and UIHC prescription capture rates prior to and after the implementation of specialty pharmacy services and a Clinical Pharmacy Specialist in the UIHC Multiple Myeloma Program.

Learning Objective: Describe the components that define specialty pharmaceuticals.

Self-Assessment Question: What is one component that is often used to define specialty pharmaceuticals?
A. Treat common medical conditions
B. Typically use a limited distribution network
C. Very inexpensive
D. Do not require laboratory monitoring or patient education

Q1 Answer: B

Admission medication reconciliation and transitions of care are times of increased risk for medication errors and patient harm. Improving admission medication reconciliation processes can improve patient safety during hospitalization and at discharge. Implementing transitions of care processes for high risk patients may reduce readmissions for these patients. A previous study at Fairview Northland showed the accuracy of admission medication reconciliation was 80.8% which resulted in medication errors. The purpose of this project is to improve admission medication reconciliation (part one) and implement a transitions of care process (part two) at Fairview Northland.

Part one of my project includes the design, education, implementation and analysis of a standardized process to improve admission medication list gathering completed by nursing. To determine the accuracy of the nurses’ medication list gathering, an analysis was completed including chart reviews of 40 patients admitted to Fairview Northland after nurses received education on the new process. The goal is to achieve 98% accuracy.

Part two of my project encompasses the design, education, implementation and optimization of a “high risk patient discharge medication reconciliation and education process” for pharmacists. Pharmacists at Fairview Northland were not previously involved in medication reconciliation on discharge and were only responsible for providing education on warfarin during hospitalizations. The time required to provide all patients discharge medication reconciliation and education will be estimated using the time required for this process.

The expected outcomes are increased accuracy of admission medication lists and increased pharmacy involvement in discharge medication reconciliation and education.

Learning Objective:
Describe the risks associated with transitions of care and explain potential ways transitions of care can be improved

Self-Assessment Question:
1. How many medication errors can be attributed to poor communication during transitions of care?
A. 10%
B. 30%
C. 50%
D. 70%

Self-Assessment Answer= C. 50%
THE UNIVERSITY OF KANSAS HOSPITAL ALARIS PUMP GUARDRAILS® QUALITY IMPROVEMENT PROJECT. Kaengkham Vouthy, Joann Moore, and Nic Rinella, The University of Kansas Hospital, 3901 Rainbow Boulevard, Mail Stop 4040, Kansas City, Kansas 66160. kvouthy@kumc.edu

The University of Kansas Hospital (UKH) utilizes the CareFusion Alaris smart pump system and Guardrails® alerts system for administration of intravenous medications. Guardrails® are alerts that fire when inappropriate settings are programmed into the smart pump (SP). The SP software is equipped with off-site drug library programming and implementation capabilities. It has safety and continuous quality improvement (CQI) components to track user actions on the SP.

The alerts can be useful tools to mitigate intravenous related medication errors; but too many alarms can lead to desensitization to the alerts called alert fatigue. This is hypothesized as one of many reasons for high rates of overriding the alerts. Guardrails® overrides occur up to 87% of the time during the initial phases of implementation of the smart pump system in hospitals. As a result, there is room for improvement to reduce potential medication errors. This CQI process requires continuous tracking and monitoring in conjunction with a standardized education and training for staff.

The purpose of this project is to decrease unnecessary alerts, decrease alert fatigue and identify gaps in training. Pharmacists collaborated with the UKH Quality and Safety Investigators group to align the SP dosing limits with dosing limits in EPIC (UKH’s electronic medication administration record).

Results will be used to optimize and remove unnecessary alerts and create a standardized education and training program to reduce potential intravenous medication errors.

Learning Objectives:
1.) Describe how pharmacists and the Quality and Safety Investigators are working together to develop a continuous quality improvement process for smart pump utilization.

2.) Discuss methods to decrease smart pump alert fatigue.

Self Assessment Questions:
1.) What is a Guardrails limit?
A. A category for medication errors
B. A procedure to order high alert medications
C. A specific term meaning safety limit
D. A medication report for smart pump errors

2.) What is alert fatigue?
A. A user's reduced sensitivity to messages
B. An error when inappropriate profiles are selected
C. When parameters are overridden
D. Alerts that cause medication errors

Q1 Answer: C  Q2 Answer: A

DEVELOPMENT OF AN INPATIENT MEDICATION THERAPY MANAGEMENT REFERRAL PROGRAM IN AN INTEGRATED CARE DELIVERY SYSTEM. Megan J. Born; Amanda R. Brummel; Melissa K. Carlson; Kelly M. Ferkul. 420 Delaware St SE, MMC 611, C-265A, University of Minnesota Medical Center, Fairview, Minneapolis, MN. mborn1@fairview.org

The study is an evaluation of a best practice alert (BPA) in the electronic health record which was developed with pharmacist input as part of a system-wide, care-coordination team. The BPA will only be evaluated for patients admitted to the University of Minnesota Medical Center, Fairview (UMMC), East Bank Campus. UMMC East Bank is one campus of an 800-bed, two-campus academic medical center. The study is approved by the University of Minnesota institutional review board.

The goal of the BPA is to identify and refer those patients, in a large, academic medical center, who will benefit most from a medication therapy management (MTM) visit because they are at a high risk for adverse drug event and/or readmissions. These patients will be identified by several criteria including: certain chronic diagnoses, certain medications, medication non-adherence, and emergency visit and admission history. The first phase of the study will be to evaluate the efficacy of the tool to identify patients. The total number of alerts fired will be recorded and evaluated as percentage of all hospital discharges. The BPA criteria will be refined to target approximately one hundred MTM visits per month.

During the second phase of the study, an inpatient care coordinator will use the BPA to identify and electronically refer patients admitted for an outpatient, pharmacist-provided MTM visit. Descriptive statistics will be used to evaluate the number of MTM referrals, visit follow-up rates, drug therapy problems identified, and 30 day readmission rates pre- and post-BPA implementation.

Learning Objectives:

1.) To describe a tool and process for increasing the MTM referral volume of high risk patients at a large, academic medical center.

Self Assessment Question:

1.) Which of the following criteria is NOT included in the BPA tool?
   a. Outpatient orders for rifaximin or lactulose
   b. Outpatient orders for typical or atypical antipsychotics
   c. Medication non-adherence
   d. Diagnosis of diabetes mellitus + 7 outpatient medication orders (excluding prn)

Q1 Answer: Outpatient orders for typical or atypical antipsychotics

2.) Discuss methods to decrease smart pump alert fatigue.

Self Assessment Questions:

1.) What is a Guardrails limit?
   A. A category for medication errors
   B. A procedure to order high alert medications
   C. A specific term meaning safety limit
   D. A medication report for smart pump errors

2.) What is alert fatigue?
   A. A user's reduced sensitivity to messages
   B. An error when inappropriate profiles are selected
   C. When parameters are overridden
   D. Alerts that cause medication errors

Q1 Answer: C  Q2 Answer: A
Unnecessary duplication of medications can be a patient safety concern if processes are not put in place to address them. Pharmacists are well positioned to intervene and prevent unnecessary medication duplications. The purpose of this project is to evaluate the number of unintentional and unnecessary drug therapy duplications and to develop a standard process for resolving these duplications to improve patient safety.

A survey aimed at assessing the level of understanding and determining the differences in process for resolving therapeutic duplications will be developed and distributed to pharmacists. In addition, a chart review will be performed at both Mercy and Unity Hospitals to determine the percentage of patients with unnecessary duplicate orders. Duplicate therapies with prioritization for administration or with different indications will be noted, but will not be considered inappropriate. A report will be created in Excellian (Epic) for categories of medications including narcotics, NSAIDs, diuretics, bowel regimen, PPI/H₂ blocker, antiemetics, hypnotic/benzodiazepines and antipsychotics. The report will run daily for one week. Charts of patients with duplicate therapies from the report will be reviewed. The medications, applicable order set, indications, dose, route, frequency, start date, end date, and administration date, time and instructions will be recorded.

The survey and chart review results will be used to identify opportunities for improvement and to develop a standardized process for addressing therapeutic duplications.

Learning Objectives:
1) Define therapeutic drug duplication
2) Identify potential therapeutic duplication issues in your institutions and develop a standardized process to resolve them

Self-Assessment Questions:
1) What is the standard definition of duplicate drug therapy used in this study
   a. when two drugs of the same class are used at the same time
   b. when two or more drugs from the same class are ordered for the same purpose without specific directions for their administrations
   c. when two drugs of the same class are used which result in an adverse drug event
   d. A and C are correct

2) Which of the following is/are considered therapeutic drug duplication
   a. Percocet po q6h pm for breakthrough pain and Oxicodone po q 12h for pain
   b. Hydromorphone IV q4h pm for pain if NPO, fentanyl patch q 72 h for pain control, Percocet po q6h pm if tolerating oral
   c. Percocet po q4h pm, morphine IV q2h pm and hydromorphone IV q6h pm pain
   d. Percocet po q4h pm for pain if tolerating oral, hydromorphone IV q2h pm, fentanyl patch q72h.

Q1 Answer: b Q2: c
Amiodarone is a commonly used anti-arrhythmic drug that has been associated with a number of toxicities, including pulmonary, liver, and thyroid. The North American Society of Pacing and Electrophysiology recommends that patients on amiodarone should have liver function and thyroid function tests at baseline and every 6 months, chest x-rays at baseline and annually, and ophthalmology exams at baseline. However, a number of studies have shown that adherence to these recommendations is low. A clinical pharmacist at the Lincoln VA has been testing a program in which amiodarone patients are followed to ensure monitoring tests are being conducted in accordance with recommendations. If a patient has not had a recommended test, the pharmacist sends a request to the prescriber to complete the test. This study looks at the effectiveness of this program. The primary objective is to compare the rate of adherence to amiodarone monitoring recommendations between patients followed by a clinical pharmacist for amiodarone monitoring and those who are monitored by usual care. It is a retrospective cohort study of all patients receiving amiodarone through the Lincoln VA from 1/1/08 through 1/1/14. Patients were followed from the initiation of amiodarone or beginning of the study period to patient death, transfer of care, discontinuation of amiodarone, or end of the study period. The primary endpoints are the average percent adherence to monitoring recommendations for liver function, thyroid function, ophthalmology exam, and chest x-rays or pulmonary function tests. Secondary outcomes included the percentage of tests that were not within normal limits.

Learning Objective
1. List ongoing monitoring recommendations for amiodarone.

Self-Assessment Question
1. Which of the following is the recommended frequency of thyroid function monitoring with amiodarone?
   a. Every month
   b. Every 3 months
   c. Every 6 months
   d. Every year

Q1 Answer: C

EVALUATION OF THE SAFETY AND EFFICACY OF PROPHYLACTIC AMIODARONE FOR PREVENTION OF POSTOPERATIVE ATRIAL FIBRILLATION (POAF) IN CARDIOTHORACIC SURGERY PATIENTS.

Postoperative atrial fibrillation (POAF) is the most common tachyarrhythmia occurring after cardiothoracic surgery (CTS). Current ACCF/AHA/ECS guidelines suggest oral beta-blocker therapy as first line prophylaxis for prevention of POAF after CTS. However, immediate administration of beta-blockers is often difficult due to postoperative hypotension. Implementation of postoperative amiodarone has been utilized to further reduce the incidence of POAF. The objective of this study is to evaluate the safety and efficacy of postoperative amiodarone therapy and develop a risk score to determine which patients may benefit from the regimen.

This single center, retrospective chart review is currently conducted at a 450-bed community hospital. CTS patients who received postoperative amiodarone therapy will be included. Patients with a history of atrial fibrillation with or without antiarrhythmic treatment will be excluded. Primary outcomes include the incidence of POAF and acute amiodarone adverse effects. Incidence of ventricular arrhythmias will be considered a second outcome. Data from primary and secondary outcomes will be analyzed using either Student’s t-test for continuous data or chi-square for categorical data. A subgroup analysis will be performed in patients who develop POAF with two or more risk factors for POAF. A univariate analysis will be performed to examine the association between POAF, and demographic, surgical, and medication utilization characteristics. A multiple logistic regression analysis will be performed to assess and quantify risk factors for POAF. The results of this study will be used to evaluate and improve protocols for the prevention of POAF at Missouri Baptist Medical Center.

Learning Objectives:
1.) Explain pertinent literature that supports the use of prophylactic amiodarone in the prevention of POAF.
2.) Identify patient-specific factors that increase the risk of developing POAF.

Self-Assessment Questions:
1.) Landmark trials demonstrated that prophylactic amiodarone:
   A. Resulted in an increased incidence of bradycardia
   B. Resulted in an increased incidence of POAF
   C. Resulted in a decreased incidence of bradycardia
   D. Resulted in a decreased incidence of POAF

2.) Which of the following factors would put patients at higher risk for development of POAF?
   A. Female gender
   B. CHA2DS2-VASc score of 2
   C. Left ventricular hypertrophy
   D. Preoperative beta-blocker administration

Q1 Answer: D  Q2 Answer: C
Infectious Disease Society of America 2011 guidelines and current studies do not specify vancomycin dosing for adolescents. The recommended dose for pediatrics is 15 to 20 mg/kg/dose every 6 to 8 hours. A recent study completed at our institution determined optimal vancomycin dosing in patients between the ages of 13 and 18 years. The results showed that vancomycin dosing differed between ages 13 to 14 and 15 to 18 years and our protocol was updated reflecting those differences. The primary objective of this study is to determine the percent of adolescents that achieve a first steady state trough goal of 10-20 mcg/mL with the new vancomycin dosing protocol at our institution. The secondary objective is to perform a sub analysis on patients whose levels are outside of goal range.

The study includes patients between the ages of 13 and 18 years who received vancomycin according to the new protocol, with at least one documented vancomycin trough level between December 9, 2013 and March 31, 2014. Patient exclusion criteria includes diagnosis of cancer, cystic fibrosis, spina bifida, cerebral palsy, chronic renal disease, burn patients, and pregnant patients. Lab exclusion criteria includes trough levels not at steady state, vancomycin obtained through home infusion, and inappropriately drawn trough levels. Data collection includes parameters necessary to determine the percent of patients with goal vancomycin levels. Descriptive statistics are utilized. The results will be used to determine whether the current vancomycin dosing protocol for adolescents at our institution is validated or requires revisions.

Learning Objectives:
1. Determine current dosing for adolescents according to IDSA guidelines.
2. Understand patients for whom the new vancomycin dosing protocol would not be appropriate.

Self Assessment Questions:
1. Current adolescent dosing is not addressed in the IDSA guidelines and dosing for this population falls into pediatric vancomycin dosing of 15-20 mg/kg/dose every 6-8 hours.
   a. True
   b. False
2. The new vancomycin dosing protocol would be appropriate for a patient with cystic fibrosis.
   a. True
   b. False

Q1 Answer: A  Q2 Answer: B

Pertussis or whooping cough is a highly contagious, bacterial respiratory tract infection that can be prevented with routine vaccination. In October 2012, the Advisory Committee on Immunization Practices (ACIP) voted to recommend routine use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) with every pregnancy. This practice is also supported by The American College of Obstetricians and Gynecologists (ACOG). Vaccination during pregnancy is optimal as maternal pertussis antibodies cross the placenta and help protect infants prior to the primary vaccination series. Early protection is important as infants from birth to three months experience a higher incidence of pertussis related complications than other age groups.

The purpose of this project is to assess compliance with national vaccination guidelines among postpartum patients by assessing antepartum clinic vaccination rates, establishing the effectiveness of hospital screening processes, quantifying the percentage of postpartum mothers vaccinated prior to discharge, and identifying potential opportunities for improvement in the process.

Patients delivering a live, term infant at the hospital during the study will be approached for inclusion. Patients who provide verbal authorization of consent will be asked questions to determine eligibility for vaccination and the patient chart will be reviewed for the appropriateness of vaccination screening and administration. The study design was approved by the local institutional review board.

Results of the study will be used to implement changes including nursing, patient, and provider education, as well as potential opportunities to revise institutional screening practices to facilitate vaccination.

Learning Objective:
1. Review the rationale for immunizing infant contacts with the Tdap vaccine.
2. State the current recommendations for Tdap vaccination during pregnancy.

Self Assessment Question:
1. The strategy of vaccinating close contacts of an infant aged <12 months with Tdap is called:
   A. Burrowing
   B. Cocooning
   C. Nesting
   D. Swaddling
2. According to ACOG, the optimal timing for routine pertussis vaccination during pregnancy is:
   A. Prior to 13 weeks gestation
   B. Between 14 and 26 weeks gestation
   C. Between 27 and 36 weeks gestation
   D. After 37 weeks gestation

Q1 Answer: [B]  Q2 Answer: [C]
Maintaining anticoagulation is important for patients placed on extracorporeal membrane oxygenation (ECMO). During ECMO, a patient's blood is exposed to the artificial surfaces of the ECMO circuit, activating the clotting cascade and placing the patient at risk for clotting. Anticoagulation on ECMO is achieved primarily by heparin. Heparin's mechanism of action is to activate antithrombin III. Antithrombin III deficiency is a common finding in pediatric patients requiring ECMO. This deficiency may result in ineffective anticoagulation by heparin.

The objective of this retrospective, descriptive study is to evaluate the use of recombinant antithrombin III in pediatric patients receiving ECMO.

Patients less than 18 years of age who received recombinant antithrombin III while on ECMO were identified using the electronic medical record system at Children's Hospital & Medical Center. The following data were collected: age, sex, weight, adverse effects (including bleeding), loading doses, boluses, and continuous infusions of recombinant antithrombin III given to patients while on ECMO as well as any anti-factor Xa and antithrombin III levels drawn. Morbidity and mortality prior to discharge were also collected.

Maintaining appropriate anticoagulation is critical for pediatric patients receiving ECMO. It is important to monitor for both bleeding and clot formation. Recombinant antithrombin III was shown to increase antithrombin III and anti-factor Xa levels in pediatric patients receiving ECMO.

Learning Objectives:
1. The learner should be able to describe recombinant antithrombin III's mechanism of action and its role in the clotting cascade.
2. The learner should be able to discuss the monitoring parameters associated with recombinant antithrombin III use.

Self-Assessment Questions:
1. Which of the following is correct?
   A. Recombinant antithrombin III is a Factor Xa inhibitor.
   B. Recombinant antithrombin III is activated by heparin to achieve anticoagulation.
   C. Recombinant antithrombin III is a vitamin K antagonist.
   D. Recombinant antithrombin III is inactivated by enoxaparin to achieve anticoagulation.
2. Which of the following needs to be monitored with recombinant antithrombin III use?
   A. WBC
   B. C-reactive protein
   C. Head Ultrasound for CNS bleeding
   D. Bilirubin levels

Q1 Answer: B  Q2 Answer: C

EVALUATION OF CLINICAL RESPONSE TO ADJUNCTIVE RIFAMPIN IN TREATMENT OF STAPHYLOCOCCUS AUREUS OSTEOMYELITIS IN PEDIATRIC PATIENTS. Krista Torrey, Marlene Hall, Michael Chang. The Children's Hospital at Saint Francis, 6161 South Yale Avenue, Tulsa, OK 74136. kmtorrey@sainfrancis.com

Staphylococcus aureus (S. aureus) is the pathogen most commonly isolated in osteomyelitis. Rifampin is frequently used as adjunctive treatment in S. aureus osteomyelitis. Supporting data are limited and conflicting. Study purpose is to compare the adjunctive use of rifampin in treatment of S. aureus osteomyelitis infections to current monotherapy treatment to determine changes in clinical response. Clinical response is defined as decrease in length of stay, time to laboratory marker normalization, afebrile days, and surgical interventions. Transition to oral therapy occurs when the C-reactive protein (CRP) is ≤2mg/dL and a declining erythrocyte sedimentation rate (ESR).

The initial phase of this Institutional Research Ethics Board-approved study consisted of retrospective chart review of osteomyelitis patients who meet inclusion and exclusion criteria during a three-year period. Eligible patients must be greater than six months and less than eighteen years old and admitted to the pediatrics unit for osteomyelitis evaluation with suspected S. aureus. Exclusion criteria include patients who do not meet the inclusion criteria as well as immunodeficiency, rifampin treatment, and antibiotics at an outlying facility.

During phase two, patients who meet inclusion and exclusion criteria are enrolled in prospective implementation of a standardized osteomyelitis order set. Inclusion and exclusion criteria for prospective phase are the same as the retrospective with the exception of excluding rifampin treatment. Order set includes a specific dosing regimen, including rifampin, as well as standardized monitoring parameters. Collection includes patient demographics, CRP, ESR, procalcitonin, temperature, complete blood count, and comprehensive metabolic panel as well as applicable clinical data.

Learning Objective:
1. List the reasons why rifampin is commonly used as adjunctive treatment in S. aureus osteomyelitis.

Self-Assessment Question:
1. Which of the following is NOT a reason rifampin is commonly used as adjunctive treatment in S. aureus osteomyelitis?
   A. Broad-spectrum, bactericidal agent
   B. Penetrates biofilms
   C. Low development of resistance
   D. Diffuses well into bone tissue

Answer to Self-Assessment Question:
1. C
EVALUATION OF POTENTIALLY AVOIDABLE 30-DAY READMISSIONS IN VETERANS. Nirali Patel, Monica Schaefer, James Lichauer, Mark Patterson. Kansas City VA Medical Center 4801 Linwood Blvd #119, Kansas City, MO 64128
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The Centers for Medicare and Medicaid Services (CMS) has begun penalizing hospitals for 30-day unplanned hospital readmissions. Hospitals are investigating ways to reduce avoidable readmissions and minimize these penalties. The primary objective of this study is to pilot use of an algorithm, using administrative and clinical data, to identify potentially avoidable 30-day readmissions in a veteran population. This work is an important step toward identifying risk factors associated with potentially avoidable readmissions as well as targeting at-risk patients for intensive post-discharge pharmacy interventions. Investigators created an algorithm, modified from the CMS hospital-wide readmission measure and SQLape algorithms, to identify potentially avoidable readmissions. All eligible index admissions between September 1, 2012 and August 31, 2013 and associated 30-day readmissions will be evaluated. Administrative and clinical data will be extracted from the VA Corporate Data Warehouse and VA-CMS data sets. Using the algorithm, all 30-day readmissions will be classified as planned or unplanned and a chart review will be performed on unplanned readmissions to further exclude those that were actually planned. Rates of planned, unplanned, and potentially avoidable 30-day readmissions will be calculated. A frequency analysis will be conducted to rank disease categories among the full cohort, potentially avoidable readmissions, and cohort where index and readmission categories are the same. A chi-square test will be used to determine whether the type of readmission (planned, unplanned, and potentially avoidable) is associated with the source of readmission (i.e. ambulatory, long-term care, or emergency).

Learning Objectives:
1.) Identify causes and risk factors for potentially avoidable 30-day hospital readmissions in the veteran population based on chart reviewed and administrative data.

Self Assessment Questions:
1.) Which of the following is a potential risk factor for a hospital readmission?
   a. Intensive post-discharge pharmacy interventions
   b. Disease states requiring extensive post-discharge follow-up
   c. Patients with no co-morbidities
   d. Patients with above average health literacy

Q1 Answer: B

IMPACT OF HIGH FIDELITY SIMULATION EXPERIENCE ON PHARMACISTS AND PHARMACY STUDENTS’ COMFORT LEVEL IN RESPONDING TO AN ACUTE ARRHYTHMIA SCENARIO IN THE HOSPITAL. Betsy Karli, Billie Bartel, Brandon Bloomgren. 1325 S Cliff Ave PO Box 5045 Sioux Falls, SD 57117 betsy.karli@avera.org

Pharmacists are continuing to become integral team members in a variety of acute patient care scenarios. However without adequate experience, many pharmacists may not feel comfortable intervening in these situations. Therefore, the need for continuing education in responding to acute situation exists. By utilizing simulation labs, pharmacists and pharmacy students can gain adequate experience and knowledge without compromising patient care.

This project is designed to assess the impact of a high fidelity simulation experience on the participants’ comfort level in responding to an acute arrhythmia in a hospital setting. Furthermore, this study will evaluate the pharmacists or pharmacy students’ ability to recognize an arrhythmia on an ECG and provide an appropriate pharmacologic intervention. A pharmacist will observe the simulation and document these two items. The primary objective will be measured by comparing results of a pre and post survey given to all participants of the simulation experience. This study may indicate whether or not pharmacists or pharmacy students may benefit from further simulation labs to develop and maintain competency in other areas of practice.

Learning Objective:
1) Evaluate the role of high fidelity simulation experience in improving pharmacists and pharmacy students’ comfort level in acute arrhythmia scenario.

Self Assessment Question:
1) Which of the following are true statements?
   A. Research has shown that simulation experience increases medical students’ adherence to ACLS guidelines.
   B. Simulation experience is increasing across pharmacy schools as part of the academic curriculum.
   C. Limited data has been published to date looking at the efficacy of simulation experiences relating to pharmacists.
   D. All of the above

Answer: D. All of the Above
ASSSESSMENT OF HEALTH LITERACY IN MEDICAL INPATIENTS AT HIGH-RISK FOR READMISSION. Kathryn Carlson, Misty Jensen, Avera McKennan Hospital & University Health Center, 1325 S. Cliff Ave, Sioux Falls, SD 57117 kathryn.carlson@avera.org

To evaluate the level of health literacy amongst medical inpatients at high-risk for readmission.

Those with low health literacy have been shown to have a higher risk of hospitalization, higher utilization of emergency services and inpatient admissions. Currently, there is no evaluation of health literacy at this institution. This study aims to assess the health literacy of high-risk medical inpatients utilizing the Brief Health Literacy Screen (BHLS) instrument, which measures both written and verbal health literacy. Understanding the level of health literacy amongst this patient population will help determine whether or not the current patient educational practices are appropriate. By understanding the level of health literacy, healthcare providers will be able to provide patient-centered disease-state and medication education. Finally, this educational approach will hopefully improve patient understanding of healthcare needs, as well as medication adherence.

Patients will be selected based on a LACE score of >11. This score determines the risk of readmission based on four factors: length of stay, acuity of admission, co-morbidities, and emergency room visits. The BHLS instrument will be administered verbally by the investigator. Patient responses, gender, and age will be collected for analysis.

Determining the risk of low health literacy is the first step in providing a more patient-centered educational approach.

Learning Objective:
1) Evaluate the utility of health literacy assessments in the inpatient setting.

Self Assessment Question:
1) Which of the following statements is correct?
A. There is not a correlation between low health literacy and readmission rates
B. Health information can overwhelm people with advanced literacy skills
C. Only patients with low literacy skills are at risk for low health literacy
D. Health literacy screening is only beneficial in the outpatient setting

Q1 Answer: B

ASSSESSMENT OF THE AVAILABILITY OF DRUG-SUPPLEMENT INTERACTION DATA IN U.S. PRESCRIBING INFORMATION. Bob Andersen, Phil Gregory, Darren Hein, Amy Wilson, Zara Risoldi-Cochrane. Center for Drug Information & Evidence-Based Practice, Creighton University, 2500 California Plaza, Omaha, NE 68178. BobAndersen@Creighton.edu

Over half of U.S. adults use dietary supplements. Many dietary supplements have the potential to interact with prescription drugs. The purpose of this study is to determine whether the prescribing information for prescription drugs in the U.S. provides information and warnings about potential drug-supplement interactions.

The prescribing information for the Top 200 Prescription Drug Products of 2012 by Total Dollars in the U.S. will be evaluated to determine what information is provided about potential drug-supplement interactions. These findings will be tabulated and characterized. Findings from the prescribing information will be compared and contrasted to evidenced-based information about drug-supplement interactions from a standard drug information resource. Each prescription drug will be searched in an online drug-supplement interaction checker available from Natural Medicines Comprehensive Database (NMCD). Interactions will be characterized based on the type or mechanism of the interaction, severity, and level of evidence.

Descriptive statistics will be used to evaluate the concordance of interaction information found in the prescribing information and that found in a standard drug information resource. Additional analyses will be conducted to determine whether interaction severity, level of evidence supporting interaction, interaction type or mechanism, or whether other factors predict whether interaction information is present in the prescribing information.

Learning Objective:
1) Discuss whether prescribing information provides information and warnings about potential drug-supplement interactions

Self-Assessment Question:
1) Which of the following statements are correct?
   a. Prescribing information is updated monthly by the FDA
   b. The FDA must approve all changes to the prescribing information
   c. All interactions are listed in the prescribing information under the “Interactions” heading
   d. The FDA recommends manufacturers supply the prescribing information for new drug applications

Q1 Answer: B
There are a variety of methods for assessing glycemic control in critically ill patients, including mean glucose value, glucose variability, 6 AM glucose and area under the curve, without an accepted standard for evaluation of adequate glycemic control. Many studies have evaluated the different methods individually and their correlation to clinical outcomes; however, few studies have compared multiple methodologies for the correlation to clinical outcomes. For example, the Centers for Medicare and Medicaid currently recommend controlling the 6 AM glucose value post cardiac surgery; however, this recommendation is not clearly supported in literature.

This is a single center retrospective review aimed at determining which analytic methods for assessing glycemic control correlates to clinical outcomes in cardiovascular surgery patients. This study includes adult patients admitted to the cardiovascular ICU at Houston Methodist Hospital from June 2006 to December 2012 undergoing a coronary artery bypass graft (CABG) and/or cardiac valve replacement or repair surgery. The primary outcome is to evaluate which methods for assessing glycemic control including, 6 AM glucose, various mean glucose values, glucose variability, minimum blood glucose and area under the curve (AUC), correlate to all cause in-hospital mortality. The correlation between the above mentioned glycemic control measures and ICU length of stay (LOS), hospital LOS and need for renal replacement therapy are secondary outcomes.

More than 5,600 patients were identified for analysis based on pre-specified procedure codes. Results from this data could support or contradict current standards for glycemic control in cardiovascular surgery patients.

**Learning Objectives**

1. Identify the different methods for assessing glycemic control

**Self-Assessment Questions:**

1. Which of the following are analytic methods for assessing glycemic control?
   a. Area under the curve
   b. Glucose variability
   c. Single fingerstick glucose level
   d. 3-day mean glucose
   e. A, B & D

Q1 Answer: E

**EVALUATION OF INHALED EPOPROSTENOL VERSUS INHALED NITRIC OXIDE FOR THE ACUTE MANAGEMENT OF PULMONARY HYPERTENSION IN CRITICALLY ILL PATIENTS.**

Pulmonary hypertension is a potentially fatal disease characterized by progressive impairment of the pulmonary vasculature, leading to elevated pulmonary artery pressures and right ventricular failure. Inhaled nitric oxide is a potent vasodilator that is selective to the pulmonary vasculature without causing significant systemic effects. Concerns regarding cost and toxicity with inhaled nitric oxide have encouraged the search for alternative therapies. Epoprostenol, a member of the prostaglandin family, has vasodilatory, anti-inflammatory, and anti-proliferative effects. This study will aim to evaluate the efficacy of inhaled nitric oxide in comparison to inhaled epoprostenol for the acute management of pulmonary hypertension in critically ill cardiothoracic patients.

This is a single-center, retrospective, chart review of critically ill patients with elevated pulmonary artery pressures (mPAP ≥ 25 mmHg) or right heart dysfunction (CVP > 16 mmHg and CI < 2.2 L/min/m²) who are managed with inhaled nitric oxide or inhaled epoprostenol for a minimum duration of four hours. Hemodynamic parameters will be collected at baseline, then at 30 to 60 minutes and 4 hours after initiating the maximum dose. The primary objective of this study is to compare the percent reduction in mean pulmonary artery pressures from baseline to 30 to 60 minutes after achieving the maximum dose of inhaled epoprostenol or inhaled nitric oxide. Secondary objectives include comparison of additional hemodynamic parameters between agents and evaluation of the total dose, duration, and cost of therapy.

Data collection and evaluation are currently being conducted; therefore results of this study are pending.

**Learning Objectives:**

1. Review the pathophysiology of pulmonary hypertension to better understand the mechanisms of actions of various treatment options
2. Describe the efficacy of inhaled epoprostenol in comparison to inhaled nitric oxide in the acute management of pulmonary hypertension

**Self-Assessment Questions:**

1. Which of the following correctly describes one of the physiologic causes of pulmonary hypertension?
   a. Decreased endothelin-1
   b. Decreased prostacyclin
   c. Increased nitric oxide
   d. Decreased thromboxane A₂

2. Which of the following characteristics of inhaled epoprostenol and inhaled nitric oxide make them suitable options for the management of pulmonary hypertension in critically ill patients?
   a. Selectivity for the pulmonary vasculature
   b. Long biologic half life
   c. Selectivity for the systemic vasculature
   d. Availability of intravenous and inhaled preparationS

Q1 Answer: B     Q2 Answer: A
Intracranial stenting is utilized for the management of intracerebral ischemia and aneurism. However, thromboembolic and bleeding events are potential complications. Dual antiplatelet therapy utilizing the combination of aspirin and a thienopyridine has been applied to this population. However, antiplatelet resistance remains a concern. The P2Y₁₂ assay calculates the P2Y₁₂ reaction units (PRU) and percentage of platelet inhibition from thienopyridines. Currently, there is limited evidence with the use of antiplatelet agents and their corresponding assays in the intracranial stent population. One retrospective analysis in patients with carotid artery stenting correlated a PRU ≤ 198 with a lower incidence of ischemic neurological sequelae. The purpose of this study is to compare the incidence of bleeding and thrombotic events in intracranial stent patients that received the assay with those that did not. Corresponding PRUs will also be evaluated.

The University HealthSystem Consortium database was used to identify all patients that received intracranial stents from November 2010 to October 2013 at a large, teaching hospital. The hospital laboratory database was used to identify patients that received the VerifyNow point of care P2Y₁₂ assay. Patients were included if they received dual antiplatelet therapy. Individuals that received a glycoprotein IIb/IIIa inhibitor prior to the P2Y₁₂ assay were excluded. Outcomes will be compared in patients that did not receive the assay. Results and conclusions are pending.

Learning Objectives:
1.) Review indications for intracranial stenting and associated complications
2.) Discuss the utility of the P2Y₁₂ assay

Self-Assessment Questions:
1. Intracranial stenting is mostly associated with which of the following complications?
   a. Blindness
   b. Thrombotic events
   c. Psychosis
   d. Seizure

2. The P2Y₁₂ assay measures platelet inhibition for which of the following drugs/classes?
   a. Aspirin
   b. Thienopyridines
   c. Glycoprotein IIb/IIIa inhibitors
   d. Thromboxane inhibitors

Q1 Answer: D

CLINICAL OUTCOMES ASSOCIATED WITH DIGOXIN USE IN PATIENTS WITH ATRIAL FIBRILLATION AND DIASTOLIC HEART FAILURE. Jonathan Balk, David Putney, Kevin Donahue. Houston Methodist Hospital, 6565 Fannin Street, Houston, Texas 77030. jlbalk@houstonmethodist.org

While digoxin use in systolic heart failure (SHF) has been associated with decreased hospitalization rates and improved symptom control, patients with diastolic heart failure (DHF) do not share the same benefits. Historically, the use of digoxin in DHF patients with normal sinus rhythm had no impact on mortality, symptom control, or hospitalization rates. However, recent conflicting literature suggests digoxin use in patients with atrial fibrillation (AF) and heart failure may be associated with a significant increase in all-cause mortality.

The purpose of this study is to review clinical outcomes in patients with diagnoses of DHF and AF and see if digoxin utilization in these patients is associated with differences in all-cause hospital mortality, all-cause 30-day readmission rates, frequency of admission to an ICU, and average length of stay. These outcomes will be assessed by retrospectively reviewing patient medical records with ICD-9 diagnoses for DHF and AF starting on January 1st 2012. Patients will be stratified by digoxin exposure and differences in clinical endpoints between the two groups will be analyzed using descriptive statistics. The results of this study will add to the current body of literature on the use of digoxin in a subset of DHF patients. In addition, the results will be reviewed to determine if further prospective research is warranted.

Learning Objectives:
1.) Compare clinical outcomes associated with digoxin use in patients with systolic heart failure versus those with diastolic heart failure

Self-Assessment Questions:
1. Historically, the use of digoxin in patients with diastolic heart failure and a normal sinus rhythm has been associated with:
   a. Lower mortality but no change in hospitalization rates
   b. No change in mortality but decreased hospitalization rates
   c. Lower mortality and decreased hospitalization rates
   d. No change in mortality or hospitalization rates

Q1 Answer: D
EVALUATION OF CURRENT ANTIBIOTIC USE FOR SURGERY PROPHYLAXIS. Elizabeth Acevedo and Lisa Veit, Allen Hospital, 1825 Logan Avenue, Waterloo, IA 50703 elizabeth.acevedo@unitypoint.org

Surgical site infections are the most common healthcare associated infection and are a major cause of increased costs and increased mortality. The implementation of evidence-based practices is integral to decreasing the incidence of surgical site infections. The ASHP Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery is a recent guideline update which provides guidance to providers based on the most recent evidence regarding the prevention of surgical site infections.

The objective of this study is to review current antibiotic usage for surgical prophylaxis and to update practices to adhere to best practices for the prevention of surgical site infections.

Orthopedic surgical patients will be evaluated for the following: time of preoperative antibiotic dose, redosing interval from preoperative dose, antibiotic agent used and dose used, and duration of antibiotic use. Recommendations will be made for changing current practices based upon analysis of current practices. Anticipated changes will be to adjust doses used and duration of antibiotic use to adhere to guideline recommendations. A cost analysis will also be conducted to review current antibiotic usage versus the usage of intraoperative dosing only.

Learning Objective: Describe the current recommendations of the optimal time to administer antibiotics pre-operatively and the appropriate redosing interval for antibiotics.

Self-Assessment question:
Antibiotic usage for surgical prophylaxis:
A. Should be administered within 2 hours of surgical incision and redosing in the operating room should be according to package insert.
B. Should be administered within 1 hour of surgical incision and redosing in the operating room at 2 x the half-life of the antibiotic in patients with normal renal function.
C. Should be administered at time of surgical incision and redosing in the operating room at 2 x the half-life of the antibiotic in patients with normal renal function.

Answer: B

Antimicrobial resistance is a well documented and growing public health concern. To combat resistance, institutions use antimicrobial stewardship programs to improve appropriate anti-infective utilization. Current inpatient guidelines on antimicrobial stewardship promote the role of pharmacists as members of stewardship teams. However, despite the need for increased antimicrobial stewardship in settings such as the emergency department (ED), there is little literature describing either efficacy of stewardship initiatives or the role of the pharmacist as part of these programs.

At our institution, a pharmacist staffs the ED for ten hours per day. In an effort to improve appropriate antimicrobial utilization in patients being discharged from the ED, guidelines on appropriate treatment for several outpatient infections were developed. The ED pharmacist was tasked with identifying patients being discharged from the ED with these infections and intervening to recommend more appropriate antimicrobial therapy.

The purpose of this study is to assess the efficacy of this pharmacist-driven stewardship initiative to improve antimicrobial use in patients who are discharged from the ED. This will be assessed through retrospective chart review of patients discharged from the ED with antimicrobial prescriptions. The proportion of appropriately prescribed antimicrobials when a pharmacist is staffing in the ED will be compared to when no pharmacist is present. Descriptive statistics will be calculated and Student’s t-test will be used to compare groups. The results of this study will be used to evaluate if the current approach to antimicrobial stewardship in the ED is beneficial or if alternative approaches are necessary.

Learning Objectives:
1.) Identify targets for improving antimicrobial usage in the emergency department

Self Assessment Questions:
1.) Which of the following common pitfalls of antimicrobial prescribing in the emergency department can be readily addressed by a pharmacist?
   a. Spectrum of activity is too narrow
   b. Excessive duration of therapy
   c. Unnecessary antimicrobial therapy
   d. B and C

Q1 Answer: D
A PHARMACIST LED APPROACH TO DECREASE INAPPROPRIATE UTILIZATION OF CLOSTRIDIUM DIFFICILE TREATMENT IN MEDICAL PATIENTS: AN OBSERVATIONAL STUDY. Daniel Barone, John Swegle. Mercy Medical Center North-Iowa, 1000 4th St SW, Mason City, IA 50401. daniel.barone@mercyhealth.com

The Infectious Diseases Society of America and the Society of Healthcare Epidemiology of America have published diagnostic and treatment guidelines for C. difficile infections, which include recommendations for appropriate antimicrobial regimens. Inappropriate utilization of C. difficile treatment can lead to increased hospital costs, length of stay, and treatment failure. The purpose of this observational study is to determine the effectiveness of physician-directed educational sessions reviewing the current guidelines and the influence on physician prescribing habits post-education.

A pharmacy database will be utilized to identify patients who received C. difficile treatment from September 2011 to September 2013. Inclusion criteria will consist of patients 18 years of age or older, diagnosis of C. difficile infection, received oral or intravenous antimicrobial therapy (metronidazole and or vancomycin), hospitalized for one or more days, and with significant symptoms. Electronic medical records will be utilized for data collection. An educational program will be developed to address appropriate diagnostic tests, medications, doses, route of administration, duration, and frequency of antimicrobial treatment. The educational program will include a pharmacy resident presentation to medical residents and physicians. A subsequent retrospective review, using the same criteria, will be completed approximately 3-4 months after the completion of the educational sessions to assess prescribing changes and guideline compliance. This study was approved by the Mercy Medical Center North-Iowa Institutional Review Board.

The results of this study will be used in order to determine if C. difficile treatment/diagnosis has improved in medical patients at MMC-N due to pharmacy education to healthcare practitioners.

Learning Objectives:
1.) Discuss appropriate treatment for C. difficile infection based on severity and/or recurrence.

Self-Assessment Questions:
1.) Identify the correct treatment regimen for a patient with an initial episode of CDI that is mild-moderate in severity:
   A) Vancomycin 125mg PO QID 10-14 days
   B) Vancomycin 500mg IV QID 10-14 days
   C) Metronidazole 500mg PO TID 10-14 days
   D) Metronidazole 500mg IV TID 10-14 days

Q1 Answer: C
The standardized method for measuring the duration of ventricular repolarization is the heart rate-corrected QT interval (QTc). A prolonged QTc interval is associated with an increased risk for ventricular arrhythmias. In patients with conduction abnormalities (i.e., patients with pacemakers and bundle branch block), increases in QRS duration impacts the QT prolongation. A strategy involving JTc monitoring (defined as QTc-QRSd) has been suggested as an alternative monitoring parameters in these patients. The AHA/ACC guideline also consider JTc interval monitoring as an alternate method to measure QT prolongation in patients who have bundle-branch blocks. Unlike QTc, JTc represents the repolarization of the ventricles.

The purpose of this study is to evaluate the extent of JTc prolongation compared to QTc prolongation in patients with or without ventricular conduction abnormalities who were being treated with sotalol or dofetilide. Secondary outcome is to assess the clinical relevance of JTc monitoring in patients with ventricular conduction abnormalities.

These objectives will be assessed through a retrospective chart review of 300 patients admitted to Houston Methodist Hospital (HMH), Houston, Texas between January 1, 2011 and December 31, 2012 and initiated on sotalol and dofetilide. Descriptive statistics will be calculated and chi-square analysis will be conducted to compare groups.

The results of the study will provide insight into the clinical relevance of JTc as a safety monitoring in patients with ventricular conduction abnormalities.

Learning Objectives:
1.) Review the significance and limitations of prolonged QTc as a safety monitoring tool in patients with bundle-branch block or nonspecific ventricular conduction delay.
2.) Discuss the clinical relevance of JTc as a safety monitoring tool in patients with ventricular conduction abnormalities.

Self-Assessment Questions:
1.) Which of the following is a limitation of QTc interval monitoring in patients with bundle-branch block?
   A. Bundle-branch block increases QRS duration which contributes to QT prolongation.
   B. Bundle-branch block decreases QRS duration resulting in abnormal QT value.
   C. Both A and B
   D. Presence of Bundle-branch block has no effect QRS duration.
2.) JTc can best be described as:
   A. QTc−QRSd
   B. Duration of depolarization in an EKG
   C. Duration of repolarization in an EKG
   D. Both A and C

Q1 Answer: A  Q2 Answer: D

Pocket hematomas (a localized collection of blood underneath the skin surrounding an implanted cardiac device) are a potential complication after implantable cardiac defibrillator (ICD) or permanent pacemaker (PPM) implantation. Hematomas can lead to an increased length of hospitalization, infection, and potentially require surgical intervention. Many patients who receive ICD or PPM implants also have indications for chronic anticoagulation. Uninterrupted anticoagulant therapy has the potential to result in hematoma formation.

Previous studies have shown conflicting data on the extent to which continuation of warfarin therapy up to the time of implantation increases the risk of pocket hematomas, and to date, little is known about the risks with the novel oral anticoagulants. The primary objective of our study is to assess the incidence of pocket hematomas at a large teaching hospital and their association with oral anticoagulant therapy including treatment with warfarin, dabigatran, rivaroxaban, and apixaban.

Retrospective chart analysis is underway with data extracted from the HERON (Healthcare Enterprise Repository for Ontological Narration) repository. Adult patients who received an ICD or PPM implantation between January 1, 2011 and December 31, 2012 are included in the study. The primary outcomes are the incidence of pocket hematomas in patients receiving oral anticoagulants versus patients not receiving oral anticoagulation and the assessment of risk factors associated with pocket hematoma development. If numbers are sufficient, a secondary outcome will be to compare the incidence of pocket hematomas in patients receiving uninterrupted therapy with the novel oral anticoagulants versus patients receiving uninterrupted therapy with warfarin.

Learning Objective:
1.) Identify risk factors that are associated with pocket hematoma formation

Self-Assessment Question:
1.) In the available literature, which of the options below have been evaluated as risk factors for the development of a pocket hematoma?
   A. Therapeutic anticoagulation
   B. Concomitant antiplatelet therapy
   C. Previous bleeding event(s) on anticoagulant therapy
   D. A and B

Q1 Answer: D
**CLOSTRIDIUM DIFFICILE: EVALUATION OF LACTOBACILLUS PREVENTION MODALITIES.**
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**CLOSTRIDIUM DIFFICILE (C. difficile)** is a spore-forming, gram-positive bacteria that causes significant morbidity and mortality each year. Probiotics, which prevent C. difficile overgrowth, are given to replace natural microflora that are disturbed due to antibiotic usage. Two probiotics (lactobacillus rhamnosus GG and lactobacillus acidophilus) are used at the Sioux Falls VA Health Care System; however, no studies have been conducted directly comparing their efficacy in reducing C. difficile rates in the Veteran population. Many studies have used a standard dose of lactobacillus GG (1 capsule twice daily), but a wide variety of lactobacillus acidophilus doses have been utilized.

The primary endpoint of this study is to determine if C. difficile rates are lower with the use of lactobacillus GG versus lactobacillus acidophilus in high-risk male and female Veterans. A secondary endpoint of this study is to evaluate the rates of C. difficile based on various doses of lactobacillus acidophilus to determine the most appropriate doses. Subgroup analyses will be performed for patients residing in the community living center (CLC), those with concomitant acid suppression therapy, and Veterans who developed C. difficile within the previous two months.

These objectives will be assessed through a retrospective chart review of male and female Veterans receiving lactobacillus GG or acidophilus for the prevention of C. difficile. The primary and secondary outcomes and subgroup analyses will be evaluated using descriptiv e analysis.

The results of the study will be used to evaluate local practices of prescribing lactobacillus GG and lactobacillus acidophilus and improve patient care.

**Learning Objective:**
1.) Recognize the role of lactobacillus GG versus acidophilus in the prevention of C. difficile.

**Self-Assessment Question:**
3.) What is the standard dose of lactobacillus GG in the prevention of C. difficile?
   a. 2 capsules daily
   b. 1 capsule twice daily
   c. 1 capsule once daily
   d. Studies have used a wide variety of lactobacillus GG doses

**Q1 Answer:** B

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**DEVELOPMENT OF HEALTH COACHING SKILLS TO ENHANCE PHARMACY STUDENT COMMUNICATION TECHNIQUES.** Alex Middendorf, Stevie Veach, Marla Tonn, Rani Shen, Christine Catney, Yu-Yu Tien, 555 W Cherry Street, North Liberty IA 52401 alex-middendorf@uiowa.edu

The aim of this project is to develop and implement a series of learning modules for Advanced Pharmacy Practice Experience (APPE) students to enhance specific health coaching skills and demonstrating skills with case-based simulated patient encounters. The Accreditation Council for Pharmacy Education (ACPE) highlights the importance of communication-related competencies for pharmacy graduates. Health coaching is a communication method where practitioners empower patients to become active participants in their own care. Pharmaceutical care services at community pharmacies offer opportunities for students to put health coaching skills into practice.

To determine necessary health coaching skills, a literature review will be conducted to aid in the development of learning modules. Examples of possible module topics include the transtheoretical model of change, motivational interviewing, and coaching styles. Modules will be implemented as part of each APPE rotation cycle and consist of skills-based readings followed by simulated patient cases to demonstrate specific skills. Medication therapy management, diabetes education, wellness screening consultations, and other pharmaceutical care services on site will provide opportunities for students to demonstrate module learning into real-world patient interactions.

The development and implementation of this project will be described, as well as barriers or limitations identified.

**Learning Objective(s):** Explain the rationale for additional training in communication-related competencies

**Self-Assessment Question(s):** Which of the following statements is not true?

A. A recent survey of pharmacy educators found that there is not an effective standardized method for teaching communication skills to pharmacy students

B. The Accreditation Council for Pharmacy Education (ACPE) accreditation standards and guidelines of 2011 do not offer specific examples of communication-related competencies that should be demonstrated before graduation

C. A recent survey found that less than 50% of University of New Mexico pharmacy experiential preceptors rated health literacy as very important

**Answer to Self-Assessment Question:** B, ACPE does offer specifics such as health literacy, cultural diversity, and behavioral psychosocial issues.
The purpose of this study is to identify factors affecting how ambulatory care providers in our health system determine to which pharmacies they refer patients for specialty medications.

Providers and staff from all ambulatory care clinics located on the premises of our health system will be surveyed. The survey will be administered using online survey software (Survey Monkey©). The survey will be developed and piloted to ascertain, those characteristics, from the prospective of clinic personnel, those characteristics of a pharmacy they feel best meets the needs of their patients. Attributes regarding provider preferences and patient factors/barriers to obtaining medications will be collected; with emphasis on those services a pharmacy could provide to assist the clinic and patients with obtaining and adherence to specialty medications. For this study a specialty medication is a high-cost (e.g., >$500/month) self-administered medication that may be limited to certain pharmacies that meet qualifications set by the manufacturer.

Nominal data will be analyzed using descriptive statistics. Study participation will be voluntary and confidential. No financial incentives will be offered to study participants. This study will be submitted for approval by the Social and Behavioral Sciences IRB of our institution before initiation.

Based on the findings, educational and other promotional materials will be developed and presented to clinic personnel to address the concerns and barriers identified.

Learning Objective(s):

1. Identify at least two characteristics all providers and staff report as being important when referring patients to a specialty pharmacy.

Self-Assessment Question(s):

1. Which of the following characteristics do all providers and staff report as being important when referring patients to a specialty pharmacy?
   a. Refill reminders for patients
   b. Helpful and friendly pharmacy staff
   c. Help completing insurance prior authorization
   d. Drug-drug/food/disease interaction notification
   e. Pharmacy's ability to handle complex medication regimens

Answer:

(a), (c), (d)

FIBRATE USE IN AN AMBULATORY CARE SETTING: A PATIENT CENTRIC APPROACH TO DEPRESCRIBING OF POTENTIALLY INAPPROPRIATE FIBRATE THERAPY.

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Pharmacological treatment of moderate hypertriglyceridemia to prevent cardiovascular events or pancreatitis is not supported with direct evidence. Addition of a fibrate to statin therapy has not been proven to be beneficial to reduce the risk of cardiovascular events. When deprescribing medications, a patient centric process that parallels the prescribing process should be used. The purpose of this quality improvement project is to measure the percent reduction of inappropriately prescribed fibrates.

Patients were identified as receiving fibrate medications from both a rural and urban panel of patients. Data collected includes but is not limited to most recent lipid panel, lipid lowering medications, diabetes status, and history of pancreatitis. Pharmacy and Therapeutics approved local criteria for use for fibrate use was presented to the interdisciplinary clinic teams. An independent pharmacist scope of practice was utilized to deprescribe inappropriate fibrates. Follow up visits are scheduled for six to eight weeks after deprescribing with analysis of fasting lipid panel. Care referrals were made as needed. The primary end point is percent reduction of fibrate use in each clinic panel. Secondary end points include patient satisfaction, changes in triglycerides and LDL, and change or addition of statin therapy.

Upon review, 81 out of 89 patients from the rural panel were on inappropriate fibrates and considered for deprescribing. In the urban panel, 52 out of 62 patients were on inappropriate fibrates. Results of this study may show inappropriately prescribe fibrates in about 70% of patients and will be used to deprescribe fibrates throughout the rest of the Minneapolis VA Health Care System.

Learning Objectives:

1. Assess for appropriate fibrate use.

Self Assessment Questions:

1. Fibrates therapy is appropriate for which patient?
   a. Triglycerides at baseline 838 mg/dL
   b. Triglycerides 1235 mg/dL
   c. Clinical ASCVD with no history of statin use
   d. Clinical ASCVD with history of myalgia on simvastatin

Q1 Answer: B
Hypnotics have demonstrated effectiveness in treating insomnia, but are known to cause a number of adverse effects and their long term safety and efficacy is not well studied. A significant body of evidence suggests that cognitive behavioral therapy for insomnia (CBTI) is an effective treatment for insomnia and that improvements in sleep are maintained over time. The objective of this investigation is to measure the effectiveness of a multidisciplinary approach to treating insomnia in reducing hypnotic use and improving sleep quality.

This project was submitted to the Institutional Review Board and deemed a quality improvement project. Data from the electronic medical record was used to identify patients who frequently fill prescriptions for hypnotics and have not undergone a trial of CBTI. Hypnotics included in this search were temazepam, zolpidem, zolpidem extended release, eszopiclone, and zaleplon. CBTI sessions consisted of three, 90 minute weekly group sessions with a mental health therapist and a pharmacist. CBTI sessions were consistent with previously validated methods to include sleep restriction, stimulus control, relaxation, cognitive strategies, and education about sleep hygiene. Efforts to target medication tapering were made at the conclusion of CBTI.

The primary outcomes to be reported will be the amount of hypnotic use and sleep quality at one month follow up. Hypnotic use will be measured by patient report and sleep quality will be measured by using the Insomnia Severity Index. Results are expected to be complete by April 2014.

Learning Objectives:
1. Identify the risks of hypnotic use
2. Identify the effectiveness of CBTI in patients with insomnia

Self Assessment Questions:
1. Benzodiazepine receptor agonists (such as zolpidem or temazepam) have been associated with which of the following?
   a. Morning sedation/hangover effect
   b. Cognitive impairment
   c. Falls in the elderly
   d. All of the above

2. Cognitive behavioral therapy for insomnia (CBTI) has been shown to be effective in which of the following?
   a. Reducing sleep onset latency
   b. Reducing number and duration of sleep awakenings
   c. Increasing total sleep time and quality
   d. All of the above

Q1 Answer: D Q2 Answer: D

Warfarin, the most commonly used oral anticoagulant, has demonstrated widespread clinical use and effectiveness in many settings. However, its use requires intensive monitoring due to a narrow therapeutic window, considerable dose response variability, and numerous drug interactions. Particularly concerning interactions involve antibiotics, however much of the available literature is in the form of case studies and case reports. Further research is needed in order to better understand their impact on International Normalized Ratios (INRs) and bleeding or thromboembolic risk.

The primary objectives of this study are to examine the effects of antibiotic therapy on INRs in patients of an outpatient anticoagulation clinic receiving stable warfarin therapy, and to serve as a medication use evaluation of pharmacist managed warfarin-antibiotic interactions. A secondary objective is to examine and compare the effects of various antibiotics used concurrently with warfarin on outcomes related to under- or overanticoagulation.

Data will be collected on the percentage of patients with the following: requiring a warfarin dose adjustment; INR values outside of the therapeutic range; an increase in INR greater than 1 point above their target range; administration of vitamin K, fresh frozen plasma, or packed red blood cells; minor or major bleeding events; thromboembolic events; and hospitalizations or Emergency Department visits secondary to anticoagulation-related events. Absolute INR increase above the target range will also be collected.

Outcomes of this study will improve understanding of the potential clinical significance of INRs outside of therapeutic range secondary to warfarin-antibiotic drug interactions.

Learning Objectives:
1.) Identify antibiotics that are likely to cause alterations in International Normalized Ratios of patients on stable warfarin therapy.

Self Assessment Questions:
1.) Which of the following antibiotics is an inducer of warfarin metabolism?
A. Levofloxacin
B. Metronidazole
C. Rifampin
D: Sulfamethoxazole-trimethoprim

Q1 Answer: C
Multimodal analgesia uses combinations of pain medications with different mechanisms and pain pathway targets. Using a multimodal approach to pain management both before and after surgery has been shown to reduce postoperative pain, decrease opioid use, minimize adverse effects related to pain medications, and produce additive analgesia. Most multimodal analgesia research published-to-date involves orthopedic or colorectal surgical patients. Despite evidence showing benefits of use, multimodal analgesia is underused clinically.

The purpose of this study is to evaluate the use and value of a multimodal pain order set for patients undergoing vaginal reconstructive surgeries or total vaginal hysterectomies. The objectives will be assessed through a single-center, retrospective chart review of gynecologic surgical patients from November 2011 to August 2013. The historical control group includes patients prior to initiation of the gynecologic multimodal pain order set implemented in May 2012. Data collected includes age, race, comorbid conditions, length of hospital stay, surgical procedure, pain medication allergies, chronic pain history, past major surgeries, home pain medications, inpatient pain medications and doses administered, and pain scores recorded using the 0-10 numeric pain intensity scale. Total oral morphine equivalents were calculated from the total pain medication usage during the hospital stay without a reduction for cross-tolerance. Data collected was analyzed to compare average pain scores, pain medication use in oral morphine equivalents, and whether or not the pain regimen was altered for patients.

The results of the study will be utilized to further develop additional multimodal pain order sets in additional patient populations.

Learning Objectives:
1.) Identify the value of using a multimodal pain management approach in gynecologic surgical patients.

Self Assessment Question:
1.) Which of the following are advantages to using a multimodal pain management approach?
   A. Minimizes side effects
   B. Improves long-term outcomes
   C. Increases opioid use
   D. Both A and B

Q1 Answer: D

IMPACT OF PHARMACIST PRESENCE ON ADHERENCE TO ADVANCED CARDIAC LIFE SUPPORT GUIDELINES DURING IN-HOSPITAL ADULT CARDIAC ARREST. Nichole Turner, Elizabeth Gau, Billie Bartel, William Coolidge, and Ryan Waybright, Avera McKennan Hospital & University Health Center, 1325 S Cliff Ave, PO Box 5045, Sioux Falls, SD 57117 nichole.turner@avera.org

Pharmacy clinical services and the role of a pharmacist on multidisciplinary teams is continuously evolving. A pharmacist on the resuscitation team can serve a variety of beneficial roles, such as preparing medications, documenting administration times and dose verification. The primary purpose of this study is to assess adherence to advanced cardiac life support (ACLS) guidelines during in-hospital cardiac arrest with and without the presence of a pharmacist.

In-hospital cardiac arrests will be evaluated for advanced cardiac life support (ACLS) adherence. The pre-intervention (pre-pharmacist involvement) group consists of cardiac arrests occurring from January 2010 through December 2010 and from January 2012 through December 2012 between 0230 and 0700 (as no pharmacist is available to attend cardiac arrests during these hours). The post-intervention group (post-pharmacist involvement) includes all cardiac arrests occurring from January 2012 through December 2012 between 0700 and 0230. Subject data will be collected from the hospital computer system records. Data includes demographic information (age and gender), time and location of the cardiac event, and the following related to each event: arrest rhythm, drug use and administration times, defibrillation use, outcome of arrest, and survival to discharge.

Data collected will be reviewed for ACLS guidelines compliance. Secondary endpoints will assess time to first and second dose of epinephrine and administration and dosing of amiodarone and atropine.

The results of this study will help to determine if pharmacist presence during cardiac arrest events is beneficial in promoting adherence to ACLS guidelines.

Learning Objective:
1). Review the advanced cardiac life support (ACLS) guidelines used during a cardiac arrest event.

Self-Assessment Question:
1.) Which of the following is a part of the cardiac arrest algorithm for a patient in PEA?
   A. CPR only
   B. Epinephrine 1 mg every 3 to 5 minutes + CPR
   C. Epinephrine 1 mg every 3 to 5 minutes + CPR + Shock
   D. Epinephrine 1 mg every 3 to 5 minutes + CPR + Shock ± Amiodarone

Q1 Answer: B
DETERMINING THE VALUES OF A STANDARD VENOUS THROMBOEMBOLISM PROPHYLAXIS PROTOCOL FOR POST ORTHOPEDIC SURGICAL PATIENTS THROUGH NURSING PERSPECTIVES AND PATIENT EXPERIENCE.
Shik-Ki Li, Nicole Hepper, 1325 S. Cliff Ave. P.O. Box 5045, Sioux Falls, SD 57117. shik-ki.li@avera.org

Currently, there is no standardized thromboprophylaxis protocol for post orthopedic surgical patients at Avera McKennan Hospital. The selection and duration of antithrombotic therapy is based on physician preference. The nursing staff plays a crucial role in administering the antithrombotics and educating the patients on the antithrombotics prior to discharge.

The purpose of this study is to determine the values of establishing a standardized thromboprophylaxis protocol for post orthopedic surgical patients through nursing perspectives and patient experience.

These objectives will be assessed through a questionnaire completed by nurses who work on the orthopedic surgical floor at Avera McKennan Hospital. The questionnaire will be designed to focus on three aspects of nurses’ perceptions of antithrombotic therapy in post-orthopedic surgical patients: 1) Experience with antithrombotics; 2) Patient education on antithrombotics; and 3) Opinions on establishing standard thromboprophylactic protocol. In addition, retrospective chart review will be conducted to review patient experience with antithrombotics such as active bleeding and delays in medication administration time.

The results of the study will be presented to the orthopedic surgical group and possibly will be used to implement a new thromboprophylaxis protocol.

Learning Objective: Recognize there is no clear consensus on the gold standard VTE prophylaxis for orthopedic patients among orthopedic surgeons

Self Assessment Question:
1. Which of the following guidelines regarding venous thromboembolism prophylaxis do most orthopedic surgeons follow?
A. Ninth Edition CHEST guidelines
B. Tenth Edition CHEST guidelines
C. American Academy of Orthopedic Surgeons Guidelines
D. Surgical Care Improvement Project Guidelines(SCIP)

Ans: C

SAFETY AND EFFICACY OF KETOROLAC ADMINISTERED TO INFANTS AND CHILDREN FOLLOWING CARDIAC SURGERY.
Ashlee Randklev, Lizbeth Hansen, Sameer Gupta, University of Minnesota Medical Center, 2450 Riverside Avenue, F3 West Building, Minneapolis, MN 55454 arandkl1@fairview.org

Pain management in pediatric patients following cardiac surgery presents a unique challenge to practitioners. While opioid analgesics are effective at treating post-operative pain, they can cause excessive sedation, respiratory depression, gastrointestinal side effects, and possibly delay extubation. Ketorolac, a potent nonsteroidal anti-inflammatory drug (NSAID), is commonly used post-operatively in adult patients as an alternative or adjunct to opioids.

The benefits of using ketorolac postoperatively in pediatric patients have been demonstrated following tonsillectomy, abdominal, urological, and orthopedic surgeries. The evidence supporting the efficacy of ketorolac use in infants and children following cardiac surgery is still lacking. The purpose of this study was to evaluate the safety and efficacy of ketorolac as an opioid-sparing agent in pediatric patients following cardiac surgery.

This study is a retrospective chart review of patients admitted at a single institution to the pediatric cardiovascular intensive care unit following cardiac surgery. Physicians at this institution began prescribing ketorolac to this patient population in early 2011. Data was collected between January 2009 and December 2012. Patients who received ketorolac post-operatively will be compared to those who did not receive ketorolac. The primary outcome is post-operative opioid requirements. Secondary outcomes include length of mechanical ventilation, intensive care unit length of stay, and hospital length of stay. Safety outcomes include a significant change in serum creatinine, creatinine clearance, or platelet count.

The outcomes of this study will provide physicians and pharmacists with the first clinical evidence of whether ketorolac use in pediatric patients following cardiac surgery is efficacious.

Learning Objectives:
1) Describe the potential benefits and risks of using ketorolac in pediatric patients following cardiac surgery.

Self Assessment Questions:
1) Ketorolac lacks which of the following side effects typically associated with opioid analgesics?
a. Respiratory depression
b. Renal dysfunction
c. Bleeding complications
d. B and C

Q1 Answer: A
ASSESSMENT OF TARGETED MYCOPHENOLATE MOFETIL THERAPY ON CLINICAL OUTCOMES IN PEDIATRIC HEMATOPOIETIC STEM CELL TRANSPLANT (HSCT) PATIENTS
Jessica Poehls, Melissa Stricherz, Cathryn Jennissen, Pamala Jacobson, Angela Smith, Paul Orchard, Jakub Tolar, Todd DeFor; University of Minnesota Medical Center, Fairview & University of Minnesota Amplatz Children’s Hospital; 2450 Riverside Avenue, F3 West Building, Minneapolis, MN 55454; jpoehls1@fairview.org

To determine whether the current targeted unbound mycophenolic acid (MPA) AUC_{0.8} level of 200-250 ng•h/mL and AUC_{0.12} level of 300-350 ng•h/mL is suitable for improving clinical outcomes in pediatric HSCT patients.

Mycophenolate mofetil is an effective immunosuppressive agent commonly used to prevent graft versus host disease (GVHD) and promote engraftment in allogeneic HSCT in both adult and pediatric populations. High inter- and intra-patient pharmacokinetic variability of MPA, the active metabolite of mycophenolate mofetil, makes it difficult to establish optimal dosing strategies.

Pediatric patients enrolled in a University of Minnesota Bone Marrow Transplant Program protocol for an allogeneic stem cell transplant that had unbound MPA levels drawn were included in this retrospective chart review. The primary objective is to determine the relationship between unbound MPA levels and clinical outcomes defined as time to neutrophil engraftment, chimerism status at days 28 and 100 post-transplant, incidence of day 100 grades II-IV and III-IV acute GVHD, and 30- and 60-day treatment-related mortality. The secondary objective is to analyze clinical covariates that may affect engraftment and acute GVHD in patients receiving mycophenolate as part of their immunosuppressive therapy. Area-under-the-curve (AUC) of unbound MPA was calculated using the linear trapezoidal method for correlation to primary objectives.

The results of this study will help determine the efficacy of the current standards of practice and may serve as a basis for future dosing recommendations in this population.

Learning Objective:
1) Recognize the variability and complexities associated with targeted mycophenolate mofetil dosing.

Self-Assessment Question:
1) Which of the following statements is correct about unbound MPA in the pediatric HSCT population?
   A. Most patients fall within the targeted AUC_{0.8} of 200-250 ng•h/mL with a starting dose of 15 mg/kg IV q8h
   B. Concentrations are not affected by hepatic dysfunction
   C. Wide inter-patient and intra-patient variability is observed
   D. All statements are correct

Q1 Answer: C

EVALUATION OF NEONATAL TOTAL PARENTERAL NUTRITION (TPN) CONTENTS.
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Management of neonates is an ever changing area of practice that can be very challenging, especially in the area of nutritional support. Various methods have been explored to help encourage appropriate prescribing as well as prevention of errors that are common with complex prescribing such as TPN.

The objective of this study was to evaluate the contents of TPNs in the neonatal intensive care unit (NICU) in order to establish prescribing trends and create standardized TPN solutions.

The study was designed as a retrospective analysis of patients having received a TPN in the NICU. Specific exclusion criteria were defined to identify patients that would benefit more from customized TPNs. TPN specific data on the amount of macronutrients and micronutrients (components) were collected and standardized for evaluation. The primary outcome was to describe prescribing practices in concentration based histograms in order to develop standardized TPN bags. Secondary outcomes included a comparison of the standardized TPNs to the prescribed TPNs and a comparison of TPN amounts to current practice recommendations for each component.

The histograms were successful in providing visual recognition of prescribing trends for the various TPN components. Evaluated independently, the modes for each component correlated to a high percentage of the original TPN bags. The high variability in prescribed doses coupled with the large number of variations possible (taking into account the nine different components) prevented establishment of standardized TPNs.

Learning Objectives:
1) Describe the benefits of standardized TPNs.
2) Report the findings of TPN component evaluation.

Self Assessment Questions:
1) Which of the following are proposed benefits of providing standardized TPNs?
   A. Less risk of compounding errors and longer stability
   B. Shorter stability and reduced financial expense
   C. Faster administration of nutrients but more risk of compounding errors
   D. Increased financial costs but lower infection risk due to better aseptic technique

2) Evaluation of the NICU TPNs showed:
   A. Individual components have equal distribution which helps in the creation of standardized bags
   B. Individual components have equal distribution but variability still prevents standardized bag creation
   C. Individual components show trends that assists in the creation of standardized bags
   D. Individual components show trends but variability still prevents creating standardized bags

Q1 Answer: A  Q2 Answer: D
Pain is a major health problem that significantly contributes to morbidity and health care resource utilization. Patient-, provider-, and system-related factors have been identified as barriers to adequate pain management. Pharmacists are important members of the health care team who possess unique knowledge of analgesic medications and can contribute to better pain management in the hospital inpatient setting.

The primary objective of this study is to assess staff pharmacist competency in basic pain management principles before and after delivery of an educational program at United Hospital. The secondary objective is to indirectly evaluate the impact of the educational program by reviewing pharmacists’ documentation of interventions related to pain management issues.

All pharmacists will be asked to take a survey assessing pain management skills and attitudes. Based on the survey results, a written educational program will be developed and distributed to all pharmacists for self-learning. Pharmacists will be required to obtain post-test scores of at least 80% to be considered competent in basic pain management. To indirectly evaluate the impact of the educational program, a retrospective patient chart review will be performed to identify the type and quantity of pharmacists’ documented interventions related to pain management.

This project will contribute to staff education and development by establishing a core competency in pain management. It is intended to improve medication use and optimize medication-associated outcomes related to pharmacological management of pain at United Hospital.

**Learning Objective:**
1) Describe the impact of an educational program for pharmacists.

**Self-Assessment Question:**
1) The United Hospital pain management educational program for pharmacists:
   - A. Serves as a competency framework in basic pain management principles.
   - B. May contribute to improved medication use related to pain management.
   - C. Includes administration of a post-test and retrospective chart review to measure its impact.
   - D. 
   - E. All of the above.

**Q1 Answer:** D

**Learning Objectives:**
1) Recognize pharmacist expressions of alert fatigue.
2) State the results of the analysis of initial medication alert data.

**Self-Assessment Questions:**
1) What pharmacist survey answer correlates with alert fatigue?
   - a. 82.14% of pharmacists have clicked through an alert notification without reading the alert
   - b. 35.71% of pharmacist agree they view more relevant than irrelevant order-verification alerts
   - c. 71.43% of pharmacists agree they have enough information to adequately assess the alerts they view
   - d. 39.29% of pharmacists report drug-allergy alerts very frequently cause them to do further research into the patient’s chart or to make an intervention before verifying the order

2) Baseline medication alert data showed:
   - a. Drug-food alerts were the type of medication alert most commonly viewed by pharmacists
   - b. Drug-allergy alerts were the type of medication alert most commonly tied to order sets
   - c. Pregnancy alerts were the type of medication alert most commonly overridden by pharmacists
   - d. Duplicate therapy alerts were the type of medication alert most commonly tied to relevant pharmacist interventions

**Q1 Answer:** A  **Q2 Answer:** C
Recent changes in payment and reimbursement structures have forced many hospitals to reevaluate their patient care standards and practice models. A large focus has been placed on readmissions and patient satisfaction as drivers of hospital quality and reimbursement. Bedside medication delivery has emerged as a new pharmacy practice initiative to improve patient care. A bedside medication delivery service was implemented at University of Missouri Health Care to help increase outpatient prescription revenues, streamline transitions of care, and improve overall patient satisfaction.

This was a prospective, non-randomized hospital quality improvement project. The primary objective of this study was to develop and implement the MIZ-Rx2U Bedside Medication Delivery Service. This project focused on the implementation of the new service in three different pilot locations across the health system. An interdisciplinary committee was formed for each unit to help with implementation and provide suggestions for quality improvement. Data was collected on the number of deliveries, number of prescriptions delivered, revenue generated from deliveries, and discharge prescription capture rates for the pilot units.

Bedside medication delivery is now offered in three inpatient units at University of Missouri Health Care. MIZ-Rx2U has served 242 patients and delivered 836 prescriptions in its first four months of operation. Discharge prescription capture rates increased 5-15% after implementing the bedside medication delivery service. The data collected form the three pilot locations will be used to develop a business plan to implement the MIZ-Rx2U Bedside Medication Delivery Service in all units at University of Missouri Health Care.

Learning Objectives:
1.) Outline the steps taken to design a bedside medication delivery service.

2.) Discuss the barriers and successes of implementing a bedside medication delivery service.

Self Assessment Questions:
1.) A key step to designing a bedside delivery service is:
   A. Handing out a brochure to physicians and nurses
   B. Ordering T-shirts for delivery staff
   C. Gathering an interdisciplinary team to help outline workflow
   D. Purchasing a tablet device to capture payment for deliveries

2.) Implementation of a bedside medication delivery service may increase prescription capture rates by:
   A. 5-10%
   B. 5-15%
   C. 10-15%
   D. 10-20%

Q1 Answer: C  Q2 Answer: B

Post-traumatic stress disorder (PTSD) is a common mental health disorder encountered in the Veterans Affairs (VA) healthcare setting. The VA/Department of Defense (DoD) PTSD guidelines have established treatment recommendations, which advise against the routine use of benzodiazepines. Benzodiazepine concerns include adverse effects, potential for abuse and dependence, insufficient evidence of benefit in reducing symptoms of PTSD, and may worsen PTSD symptoms upon discontinuation.

Overuse of benzodiazepines in patients with PTSD is a concern nationally and locally. The project’s primary objective is to improve adherence to the VA/DoD guidelines in regards to benzodiazepine utilization in patients admitted to a Mental Health Residential Rehabilitation Treatment Program (MHR RTP). The secondary objective is to monitor for withdrawal symptoms following discontinuation of benzodiazepines in PTSD patients.

A retrospective chart review was completed to assess current utilization of benzodiazepines in MHR RTP patients. The chart review assessed utilization of pertinent psychiatric medications, diagnosis of certain psychiatric disorders, demographic data, benzodiazepine dose adjustments, and benzodiazepine withdrawal symptoms. MHR RTP staff completed a questionnaire to assess current benzodiazepine prescribing practices and knowledge of appropriate benzodiazepine use. A pharmacist provided verbal and written education to MHR RTP staff and patients regarding benzodiazepine use in PTSD. A list of MHR RTP patients with PTSD taking benzodiazepines was given to providers monthly. A second chart review and questionnaire was completed after project implementation to assess impact of education on benzodiazepine utilization. Data analysis is currently in progress and final results will provide insight on current benzodiazepine prescribing practices and the impact of project education.

Learning Objectives:
1) Explain three reasons why benzodiazepines are not recommended in patients with PTSD

Self Assessment Questions:
1) Which of the following is a reason why benzodiazepines are not recommended in patients with PTSD?
   a. Use can exacerbate PTSD symptoms
   b. Abuse and dependence potential
   c. Major drug interaction with first line PTSD treatment antidepressants
   d. Narrow therapeutic range

Q1 Answer: B
With involvement in two wars over the past decade, there has been a documented increase in depression prevalence and suicide incidence among US military veterans. Because higher proportions of veterans come from rural communities, access to care may be an issue when behavioral health care is needed. While the Veterans Administration has expanded health services in rural areas; this has not always resulted in increased service utilization. This study examined the prevalence of depression and associated health service deficits (HSDs) for rural versus non-rural US military veterans. Using bivariate and multivariate techniques, 2006 Behavioral Risk Factor Surveillance System (BRFSS) data were analyzed. Bivariate analysis revealed that rural veterans had greater odds of having at least one HSD, being currently depressed as measured by the Personal Health Questionnaire-8 (PHQ-8), and having lifetime depression. Logistic regression analysis confirmed that rural veterans had higher odds of both current and lifetime depression than non-rural veterans when controlling for socioeconomic status and race/ethnicity. Additionally, logistic regression analysis also revealed that rural veterans with current depression had higher odds of being Hispanic or Other/Multiracial than Caucasian, not employed for wages than employed for wages, <65 years of age, and reported having at least one HSD.

**Learning Objectives:**

1. Recognize major risk factors for depression among rural US military veterans
2. Define the concept of health service deficits (HSDs)

**Self Assessment Questions:**

1. In this study, which of the following characteristics increased the risk for depression in rural US military veterans the most?
   a. Being < 65 years old
   b. Having at least one health service deficit (HSD)
   c. Being unable to work
   d. Being of poor socioeconomic status (SES)

2. Health service deficits (HSDs) are composed of:
   a. No routine medical exam, no primary care provider, no health insurance, and/or a deference of medical care because of cost, all within the last 6 months
   b. No routine medical exam, no primary care provider, no health insurance, and/or a deference of medical care because of cost, all within the last 12 months
   c. No routine medical exam, no primary care provider, no health insurance, and/or a deference of medical care because of cost, all within the last 18 months
   d. No routine medical exam, no primary care provider, no health insurance, and/or a deference of medical care because of cost, all within the last 24 months

**Q1 Answer:** C

**Q2 Answer:** B
MINIMIZED DOSING OF RABBIT ANTI-THYMOCYTE GLOBULIN INDUCTION FOR PREVENTION OF ACUTE RENAL TRANSPLANT REJECTION. Tania K. Kapoor, Sarah Hutton, Larry Burris, and Tyler Turek, Sanford USD Medical Center, 1305 W. 18th St., Sioux Falls, SD 57117. tania.kapoor@sanfordhealth.org

Rabbit anti-thymocyte globulin (rATG) is a polyclonal antibody that acts as a lymphocyte depleting agent and is used as the agent of choice for immunosuppressive induction of organ transplantation in the United States. Many renal transplant centers commonly use a rATG dose of 1.5 mg/kg/day for 5-10 doses as the standard of care for transplant induction therapy.

The purpose of this study was to compare outcomes of the Sanford Health Transplant Center’s new minimized dosing scheme guided by CD3+ counts with our historically used higher dosing scheme (>4 doses) of rATG used for induction of renal transplantation.

A retrospective chart review was conducted of patients who received a renal transplant at Sanford USD Medical Center between April 2007 and September 2013, and received induction with rabbit anti-thymocyte globulin. Subjects were split into 2 groups: minimized rATG dosing and standard dosing. The study outcomes analyzed were the incidence of: acute rejection, mortality, graft survival, and delayed graft function.

The average total cumulative dose of rATG was 534.2 mg (ave.5.22 total doses) in the standard group versus 366.47 mg (ave.3.72 total doses) in the minimized group. There were no significant differences in rates of acute rejection, delayed graft function, graft loss, and mortality due to allograft between the standard group and minimized group at 12 months post-transplant.

This study demonstrates that using a minimized rATG dosing scheme guided by CD3+ counts is safe and non-inferior in regards to incidence of acute rejection, graft loss, and mortality in renal transplant recipients.

Learning Objectives:
1.) Report the efficacy of using minimized dosing of rabbit anti-thymocyte globulin guided by CD3+ counts in renal transplant patients

Self Assessment Questions:
1.) The minimized rATG dosing group guided by CD3+ demonstrated:
   A. A significant increase in acute rejections & mortality
   B. That they received significantly higher weight-based doses of rATG
   C. No significant differences in acute rejections, mortality, and graft loss
   D. That they received significantly higher cumulative doses of rATG

Q1 Answer: C

EFFICACY AND DURABILITY OF RESPONSE UTILIZING INTRAVENOUS IMMUNOGLOBULIN AND RITUXIMAB FOR THE DEVELOPMENT OF DONOR-SPECIFIC ANTIBODIES AFTER LUNG TRANSPLANTATION. Elizabeth Nothdurft, Jennifer Iuppa, Bennett Bain, Barnes-Jewish Hospital, 1 Barnes-Jewish Plaza, Saint Louis, MO 63110 ess9363@bjc.org

Over the last few years, case-control and prospective epidemiological studies have demonstrated an association between de novo donor specific antibodies (DSA) and poor outcomes in solid-organ transplant recipients, including graft loss. Several studies in lung transplant recipients specifically, have observed an association between DSA and high-grade persistent-recurrent acute cellular rejection and bronchiolitis obliterans syndrome. No study, however, has investigated the durability of response to treatment, or risk factors associated with either lack of response or relapse. To address this issue, we will analyze the effects of treatment with intravenous immune globulin with or without rituximab in patients who developed DSA after lung transplantation.

We plan to conduct a retrospective, observational, single-center cohort study evaluating all patients 18 years of age and older that received lung transplantation between July 1, 2006 and August 31, 2012, survived at least 30 days, and were treated for DSA. Data will be extracted using the Organ Transplant Tracking Record, inpatient admission and discharge summaries, laboratory reports, and clinic notes. The overall time course of DSA after treatment will be documented, and risk factors for non-response and relapse will be investigated.

The primary endpoint of our analysis will be the incidence of complete response (DSA mean fluorescent intensity < 2000). Secondary endpoints will include time to response, duration of response, relapse rate, incidence of antibody-mediated rejection, freedom from BOS, survival and predictors for DSA clearance.

The results of this study will be used to determine the impact of DSA treatment on the presence of DSA.

Learning Objectives:
1.) Define the prevalence of donor specific antibodies (DSA) after lung transplantation.
2.) Relate the effect of DSA presence after lung transplantation and treatment response on clinical outcomes such as mortality and bronchiolitis obliterans syndrome.

Self Assessment Questions:
1.) What is the prevalence of DSA after lung transplantation?
   A. Less than 10%
   B. 10-20%
   C. 30-50%
   D. Greater than 90%
2.) What outcomes are associated with DSA presence after lung transplantation?
   A. High-grade and persistent-recurrent acute cellular rejection
   B. Infection
   C. Bronchiolitis obliterans syndrome
   D. A and C

Q1 Answer: C Q2 Answer: D
HEPATITIS B IMMUNE GLOBULIN IN COMBINATION WITH AN ORAL NUCLEOS(T)IDE TO PREVENT HEPATITIS B RECURRENT AFTER LIVER TRANSPLANTATION AT AN ACADEMIC MEDICAL CENTER. Laura Gleason, Jennifer Nieman, Timothy McCashland, Sandeep Mukherjee, Molly Thompson, The Nebraska Medical Center, 981090 Nebraska Medical Center, Omaha, NE 68198-1090. lgleason@nebraskamed.com

The current standard of care for hepatitis B virus (HBV) positive liver transplant recipients is a combination of HBIG and an oral nucleos(t)ide analogue. However, limitations of HBIG include high cost and parenteral administration. With the availability of newer nucleos(t)ide analogues with less resistance, transition to lower dose HBIG or elimination of HBIG earlier post-transplant is being studied. The most efficacious and cost-effective combination regarding dose and length of therapy of HBIG and the specific oral nucleos(t)ide to prevent recurrence of HBV after liver transplantation is still being studied and has not been standardized.

This study will determine the efficacy and cost of prophylactic treatments for patients receiving liver transplants due to HBV at The Nebraska Medical Center. This retrospective chart review will include patients 19 years and older who have received a liver transplant for HBV during the last 10 years (January 2003 – July 2003) and received a combination of HBIG and an oral nucleos(t)ide antiviral therapy. Data being collected includes demographic information, biopsy results, prophylactic medication regimens, and laboratory values to determine efficacy and cost of prophylactic treatment.

The primary outcome is biopsy-proven HBV recurrence post liver transplant to determine efficacy of prophylactic treatment. Secondary outcomes include patient survival (at 1 year and 5 years post transplant), time to HBV recurrence, length of HBIG therapy, cumulative cost and average cost of HBIG per patient based on wholesale acquisition cost (WAC).

Data collection and evaluation are currently being conducted.

EVALUATION OF THE USE OF DEXMEDETOMIDINE IN THE TREATMENT OF ALCOHOL WITHDRAWAL AND THE DEVELOPMENT OF A PROTOCOL FOR SEVERE ALCOHOL WITHDRAWAL. Christina Stafford, Diane McClaskey, Jennifer Catlin, Mark Carlson, CoxHealth, 3801 S. National Ave., Springfield, MO 65807. christina.stafford@coxhealth.com

Alcohol withdrawal can have serious consequences in the hospitalized patient, including adverse outcomes and longer length of stay with resultant in increased cost of care.

This was two-phase project. The initial phase evaluated patients treated with dexmedetomidine in alcohol withdrawal and those treated with the current protocol that utilizes benzodiazepines without use of dexmedetomidine. The primary objective of this evaluation was to compare benzodiazepine use and length of intensive care unit (ICU) and hospital stay for each group. A secondary objective was to determine costs associated with a longer ICU and hospital stay. The secondary analysis was used to identify reasons for and consequences of deviations from the current protocol.

The initial phase was a retrospective, cohort medication-use evaluation in patients who were treated for alcohol withdrawal over a 27-month period. During the secondary analysis portion, additional data was collected, which included doses of dexmedetomidine, adjunctive use of benzodiazepines and continued monitoring of symptoms.

A total of 66 patients met the inclusion criteria for the initial phase. The patients in the dexmedetomidine plus benzodiazepine group used higher amounts of benzodiazepines, utilized benzodiazepines for a longer duration, spent more time in both the ICU and the hospital, and had significant additional costs when compared to the benzodiazepine only group. From these results, it was determined that a revision needs to be developed for the treatment and prevention of severe alcohol withdrawal. The results of both phases, along with recently published literature, were presented to an interdisciplinary team to evaluate and revise the current protocol.

Learning Objectives:
1) Recognize the consequences of treating severe alcohol withdrawal outside of a written protocol.
2) Discuss the process of writing new protocols for the prevention and treatment of severe alcohol withdrawal.

Self-Assessment Questions:
1) Consequences of not following a written protocol for the treatment of severe alcohol withdrawal may include:
   a. Oversedation of patients
   b. Longer length of stay in the ICU
   c. Increased cost of care
   d. All of the above

2) A protocol for the prevention and treatment of severe alcohol withdrawal should include all of the following EXCEPT:
   a. The symptoms of alcohol withdrawal
   b. The cheapest way to treat a patient
   c. Medications (scheduled and as needed)
   d. An agitation/sedation scale

Q1 Answer: D  Q2 Answer: B
OBJECTIVES: Limited studies have been conducted on vancomycin pharmacokinetics in obese or morbidly obese patients, most of which are limited by small sample size or retrospective study design. The main objective of this study is to determine the steady-state pharmacokinetic (PK) parameters of obese patients receiving intravenous vancomycin. The secondary objectives of this study are to determine if there were any differences in PK between critically ill and non-critically ill patients as well as if there were any differences between body mass index (BMI) groups (30-39, 40-49, ≥50).

METHODS: This is a prospective, single center, cohort study of obese and morbidly obese patients being treated with vancomycin. Inclusion: hospitalized patients aged ≥ 18 years, BMI > 30, and receiving intravenous vancomycin. Exclusion: acute kidney injury and/or chronic renal failure (defined as serum creatinine [SCr] ≥ 1.5 mg/dL, SCr increase of 0.5 mg/dL in 24 hours, or receiving any form of dialysis), liver failure with ascites requiring paracentesis, patients requiring the massive transfusion protocol, if treatment was discontinued before steady state, if care was being withdrawn, pregnancy, incarceration, or any underlying psychological disorders that would preclude the patient from giving informed consent.

RESULTS: To be presented during the 2014 Midwest Pharmacy Residents Conference

CONCLUSION: To be presented during the 2014 Midwest Pharmacy Residents Conference

LEARNING OBJECTIVES:
1. Describe vancomycin pharmacokinetics in obese patients
2. Discuss the differences between critically ill and hospitalized obese patients

SELF-ASSESSMENT QUESTIONS:
1. According to the World Health Organization, how many people worldwide are obese?
   A. 200 Million
   B. 300 Million
   C. 400 Million
   D. >500 Million

2. The volume of distribution of vancomycin in obese patients is usually > 0.7 L/kg (ABW)
   A. True
   B. False

Q1 answer: D    Q2 answer: B

Benzodiazepines have long been the standard of care for alcohol withdrawal syndrome (AWS). Critically ill patients with AWS often require increasing doses of benzodiazepines, which can lead to complications and prolonged hospitalization. Dexmedetomidine, a selective centrally acting alpha-2 adrenergic agonist, shows promise as an adjunctive therapy for AWS. It does not produce respiratory depression, has a short half-life, and can be easily titrated. The objective of this study was to analyze the efficacy and safety of dexmedetomidine compared with benzodiazepine monotherapy in patients treated for AWS in a 25-bed mixed medical-surgical intensive care unit at an academic hospital. The medical charts of 200 patients hospitalized during 2010-2013 were reviewed using pharmacy records and DRG codes. Data were collected on patient demographics, chemistry panels and AWS assessments, dexmedetomidine and benzodiazepine utilization, and adverse events. The primary endpoint for efficacy was length of ICU stay. The primary endpoint for safety was hypotension and bradycardia. Secondary analysis examined the comparative benzodiazepine use in patients treated with dexmedetomidine and in patients treated with benzodiazepines alone. Prior retrospective studies suggest a role for dexmedetomidine in AWS treatment, but these studies are small and limited. To the best of our knowledge, this is the largest retrospective review evaluating dexmedetomidine for AWS. The results of this study will be presented at the 2014 Midwest Pharmacy Residents Conference.

Learning Objectives:
1. Review alcohol withdrawal syndrome.
2. Describe dexmedetomidine and its potential role in alcohol withdrawal syndrome.

Self-Assessment Questions:
1. Patients undergoing AWS treatment are frequently monitored. Which of the following is a validated assessment tool for alcohol withdrawal?
   a. Penn Alcohol Craving Scale (PACS)
   b. Clinical Institute Withdrawal Assessment (CIWA)
   c. Train of Four (TOF)
   d. Richmond Agitation Sedation Scale (RASS)

2. The side effect profile of dexmedetomidine includes the following:
   a. QT prolongation
   b. Edema
   c. Adrenal insufficiency
   d. Bradycardia

Answers: 1. B; 2. D
To determine the cost-benefit of penicillin allergy skin testing (PAST) by pharmacists.

About 10% of the population reports a penicillin allergy, but when tested only 1% have a true allergy. A reported penicillin allergy has been shown to lead to increased healthcare costs, length of stay, and mortality.

A pilot program was performed to determine the cost-benefit of PAST. The test was ordered by a physician when a penicillin allergy was impacting antibiotic selection. The pharmacist reviewed inclusion and exclusion criteria, performed the test, and reported the results to the ordering provider to make antibiotic changes if applicable. A cost-benefit analysis compared estimated antibiotic costs without testing to actual antibiotic costs after testing, on both initial and subsequent antibiotic courses.

PAST was performed on 30 patients over two months: 26 (86.67%) were negative, 2 (6.67%) were positive, and 2 (6.67%) were indeterminate. 24 of the 26 were challenged with a beta-lactam antibiotic, none of which had an allergic reaction. Estimated initial antibiotic treatment costs without PAST were calculated to be $8703.19 compared to actual antibiotic costs after testing of $4400.98. The cost of testing was $2506.20 resulting in a savings of $1796.01. Subsequent antibiotic treatment costs without PAST were calculated to be $1738.99 compared to actual antibiotic costs after testing of $699.81 resulting in a savings of $1039.18.

Initial data from this pilot suggest that PAST is safe and easy to perform, that true penicillin allergies are rare, and there is a cost-benefit in testing for penicillin allergies.

Learning Objectives:
1. Review the mechanism and epidemiology of penicillin allergies.
2. Explain the feasibility of penicillin allergy skin testing in a medical center.

Self-Assessment Questions:
1. Which of the following are true about penicillin allergies?
   A. Penicillin allergies are under reported.
   B. True penicillin allergies affect about 1% of the population.
   C. Penicillin allergies can increase healthcare cost.
   D. Both (B) and (C)
   E. All of the Above
2. The penicillin allergy skin testing pilot showed that:
   A. Patients accurately report penicillin allergy.
   B. Penicillin allergy skin testing results in a cost reduction.
   C. A high percentage of patients reacted to beta-lactams after a negative skin test.
   D. Penicillin allergy skin testing reduced mortality.

Q1 Answer: D  Q2 Answer: B
Vancomycin minimum inhibitory concentration (MIC) ‘creep’ in methicillin resistant *Staphylococcus aureus* (MRSA) has been noted over the past several years and has been associated with an increase in treatment failures. Linezolid and daptomycin are two alternatives to vancomycin for treatment of MRSA, especially when the MIC is >1, due to an increased risk of treatment failure of vancomycin.

Due to a high rate of MRSA with a MIC > 1 at Regions Hospital, current policies in the surgical intensive care unit (SICU) encourage physicians to preferentially empirically start linezolid or daptomycin in patients with severe infections. Despite this policy, there is significant variability in the selection of empiric MRSA coverage in the SICU. This study will evaluate patient-specific factors that relate to antibiotic selection in the critically ill. The goal is to determine whether physicians preferentially use linezolid and daptomycin (L&D) in more critically ill patients, as defined by SIRS criteria and the use of vasoactive agents.

This will be a retrospective chart review from June 1, 2013-December 31, 2013 with patients assigned to L & D or vancomycin groups based on empiric antibiotic selection. The primary endpoints are proportions of positive blood cultures, patient meeting SIRS criteria, and patients requiring a vasoactive agent. Chi-squared analysis will be used to test the primary endpoints for statistical significance. This data will assist Regions Hospital in assessing compliance with current policies.

**Learning Objectives:**

1. Explain what specific characteristics could favor the empiric use of linezolid or daptomycin over vancomycin in critically ill patients.

**Self Assessment Questions:**

1. Which of the following characteristics would not strongly relate to the empiric use of linezolid or daptomycin over vancomycin in critically ill patients?
   a. The MIC trends of MRSA in your institution
   b. The type of infection or presumed infection
   c. The severity of illness of your patient
   d. The highest recorded temperature

The challenge of effectively treating Gram-positive infections in the present environment of escalating resistance has necessitated re-evaluation of dosing for older antibiotics such as vancomycin. Although regarded as the mainstay of therapy for potential methicillin resistant *Staphylococcus aureus* infections, controversy still exists surrounding the optimal approach to dosing vancomycin. Recent literature suggests a dosing nomogram as a method of standardization for vancomycin initiation strategies. By utilizing a nomogram to target a trough level of 15-20 mg/L, the goal is to provide a more consistent dosing scheme that will produce levels in the therapeutic range that are both accurate and precise.

The purpose of this study is to evaluate the rate of levels within the therapeutic range based on current dosing strategies and to compare doses suggested by a vancomycin dosing nomogram. A secondary purpose will be to implement the nomogram within the pharmacy.

To achieve these objectives, a retrospective chart review for a baseline assessment of current vancomycin dosing was performed. Approval was obtained from the Institutional Review Board. Following the retrospective review, the results of the analysis will be used to implement a dosing nomogram that targets a trough of 15-20 mg/L to guide initial dosing by pharmacy. A formal education session and survey will be provided to all pharmacists before the initiation of the vancomycin dosing nomogram, and a follow-up survey will also be completed by pharmacists.

**Learning Objectives:**

1.) Identify indications for treatment with vancomycin that require higher target troughs of 15-20 mg/L.

2.) List the patient characteristics to be considered when selecting an initial vancomycin dose and interval.

**Self-Assessment Questions:**

1.) Which indication for vancomycin therapy requires a higher target trough of 15-20 mg/L?
   a. Osteomyelitis
   b. Cellulitis
   c. Uncomplicated urinary tract infection
   d. Peritonitis

2.) Which patient characteristics need to be included in calculations for the dosing nomogram?
   a. White blood cell count
   b. Temperature
   c. Serum creatinine
   d. Procalcitonin

Q1 Answer: A  Q2 Answer: C
Antimicrobial resistance is increasing, partially because of injudicious use of antimicrobials. Antibiotic stewardship is one method of helping control the development of resistance. According to the Infectious Diseases Society of America, education supplements core stewardship strategies and is essential for a successful stewardship program. Adult learning theory suggests that education is most effective when it is repetitive, based on real scenarios, and is implemented with immediate feedback. Studies also show that case-based learning improved memory retention in comparison to conventional teaching methods and that participants preferred online cases over traditional lectures. One institution has embraced this concept and sends an Antimicrobial Management Team Question of the Week to clinicians weekly via e-mail, and this method has been well received.

The purpose of this study is to evaluate whether online interactive case-based antibiotic education increases internal medicine residents’ knowledge of antimicrobial spectrum, empiric selection, and de-escalation. A secondary purpose is to describe participation, satisfaction, and confidence scores pre- and post-intervention.

This is a voluntary, prospective cohort study developed by a team of pharmacists, physicians, a microbiologist, and an administrator. Knowledge will be measured using various infectious disease cases comprised of clinical pearls and pre- and post-test questions. Satisfaction and confidence will be assessed through questionnaires. Data will be analyzed using descriptive statistics and paired Student’s t-tests or Wilcoxon signed rank tests.

Results will be used to assess the effectiveness of this educational tool for internal medicine residents and determine the feasibility of its perpetual continuation.

Learning Objectives:
1. Describe how learning is best accomplished based on the adult learning theory.

Self Assessment Questions:
1. How is learning best accomplished based on the adult learning theory?
   A. Repetitive exposure to real cases
   B. Traditional lectures
   C. Repetitive exposure to real cases and immediate feedback
   D. Traditional lectures and immediate feedback

Q1 Answer: C

Pain is a significant stressor to patients especially patients in the intensive care unit (ICU). The pain, sedation, and delirium guidelines recommended using either the Behavioral pain scale (BPS) or the Critical-Care Pain Observation Tool (CPOT) as they both have been previously validated in mechanically ventilated patients. The purpose of this study is to compare the clinical effectiveness, based on nurses’ evaluations, in comparison of two validated pain scales, the CPOT and BPS in assessing pain in mechanically ventilated patients.

This study will begin trialing the CPOT with the nursing staff for one month. After the first trial month, the nursing staff will complete an anonymous survey regarding their experiences with the CPOT pain scale. The following month, the BPS pain scale will be trialed in the ICU. The nursing staff will complete an anonymous survey regarding their experience with BPS. Finally, nursing will fill out one final survey regarding their preference of which pain scale they thought was most helpful to their patients. After the 3rd and final survey, a decision will be made to recommend a particular pain scale to the ICU Evidence Based Practice Committee based on the results of the nursing staff surveys. All data will be recorded without patient identifiers and maintained confidentially.

The results of this study will assist in identifying which patients are in pain and may need additional therapies to help control their pain.

Learning Objectives:
#1: Explain why it is important to be able to identify pain in mechanically ventilated patients.
#2: Identify which pain scales are recommended in the Pain, Agitation and Delirium Guidelines

Self Assessment Questions:
#1: It is important to identify pain in patients which are mechanically ventilated because:
   a) Patients want to be more sedated while ventilated.
   b) Patients may have an underlying pain that they can’t express to the provider.
   c) Pain control isn’t an issue as the patient will be sedated while ventilated.
   d) It’s not important to identify pain in these patients

#2 Which pain scales are recommended by the Pain, Agitation and Delirium Guidelines
   a) FLAG and BPS
   b) Non-verbal pain score and FLAC
   c) RASS and BPS
   d) BPS and CPOT

Q1 Answer: B  Q2 Answer: D
Dexmedetomidine is a centrally acting alpha 2-adrenergic agonist primarily used for short-term sedation in critical care patients. Multiple studies have demonstrated its safety and efficacy in ICU sedation management but studies are lacking that have assessed patients with inadequate response. Treatment failures are problematic as they create delays in therapy and increased healthcare costs.

The intent of this study was to evaluate patients that have inadequate response to dexmedetomidine to assess if there is a significant patient characteristic trend compared to patients with adequate response. Patient characteristic data was collected by retrospective chart review of all patients admitted to the intensive care unit that were mechanically ventilated and started on dexmedetomidine. Inadequate response was labeled as the addition or escalation of sedatives or antipsychotic therapy between 1 and 8 hours after starting dexmedetomidine without an apparent adverse drug reaction associated with dexmedetomidine. Descriptive statistics was used to report the findings of the study.

The results of this study will be utilized by the organization to assess appropriate use of dexmedetomidine for sedation.

Learning Objective:
1) Identify patient characteristics in critical care patients that have inadequate response to dexmedetomidine compared to patients with adequate response to help guide appropriate therapy.

Self Assessment Question:
1) Which of the following statements is correct?
A. There are many studies assessing patients with inadequate response to dexmedetomidine.
B. A disadvantage of dexmedetomidine is that it causes respiratory depression.
C. Dexmedetomidine is a selective alpha-2-adrenergic agonist.
D. Critical care guidelines suggest benzodiazepine sedatives may be preferred to improve clinical outcomes.

Q1 Answer: C

One of the most common clinical indications for prescribing antimicrobial agents is acute uncomplicated cystitis in otherwise healthy subjects. Clinical practice guidelines for the treatment of acute uncomplicated cystitis were published by the Infectious Diseases Society of America (IDSA) in 1999. Trends in antimicrobial resistance to bacterial urinary isolates in outpatient subjects have increased throughout the past decade in the United States since the IDSA guidelines were published. This study will evaluate antimicrobial resistance patterns in community onset urinary tract infections that are seen in the emergency department at Avera McKennan Hospital.

The laboratory reporting system was utilized to identify patients who have had a positive urine culture result after evaluation in the emergency department from September 1, 2012 through August 31, 2013. Retrospective chart review will be completed on subjects meeting the following inclusion criteria: age greater than or equal to 16 years presenting to the emergency department, urinalysis with reflex order for urine culture, and prescribed antimicrobial therapy in the emergency department. The results of this study will allow the investigators to develop an empiric treatment protocol for urinary tract infections of those outpatients that will receive antimicrobial therapy and/or a prescription for antimicrobial therapy from the emergency department prior to final culture results.

Learning Objective:
1. Evaluate the available literature for empiric antibiotic recommendations in community onset urinary tract infections

Self-Assessment Question:
1. A 21 year old female with no PMH and NKDA presents to the ED with urinary frequency and painful urination. UA shows positive leukocyte esterase, positive nitrate, and many bacteria. The ED physician asks for your recommendation for empiric antibiotics (the resistance rate in your community for sulfamethoxazole/trimethoprim is 30%). Which option below is correct?
   a. Cephalexin 500mg PO 4XD x 5 days
   b. Sulfamethoxazole/trimethoprim DS 800/160mg PO BID x 5 days
   c. Ciprofloxacin 500mg PO TID x 5 days
   d. Ertapenem 1 gram IV daily x 5 days

Q1 Answer: A
EVALUATING THE EFFICACY OF TRANEXAMIC ACID IN ADULT TRAUMA PATIENTS WITH, OR AT RISK FOR, SIGNIFICANT HEMORRHAGE. Lyndsey Riley, Thomas Gregory, Tony Huke, Truman Medical Center, Kansas City, MO 64108. lyndsey.riley@tmcmed.org

Significant hemorrhage due to trauma is a life-threatening emergency. Recently, two well designed, randomized, controlled trials, CRASH-2 and MATTERS, showed that administration of tranexamic acid in trauma patients with significant hemorrhage reduced mortality. Given the evidence, the emergency department trauma provider order set at our institution has been revised to include tranexamic acid for the management of patients with significant traumatic hemorrhage presenting within three hours of injury. Tranexamic acid has the potential to decrease mortality, length of intensive care unit stay, days spent on the ventilator, as well as total blood product use.

The primary outcome of this study is to evaluate mortality rates pre and post-implementation of a newly revised emergency department trauma provider order set. Secondary outcomes will be assessed including intensive care unit days, ventilator days, and total blood product use.

The control group for this study will be historical patients seen in the emergency department with, or at risk for, trauma-associated hemorrhage. A monthly report will be generated identifying prospective study participants who receive tranexamic acid (1 gram/100ml 0.9% sodium chloride IV over ten minutes followed by tranexamic acid 1 gram/100ml 0.9% sodium chloride IV infused over eight hours) in the emergency department or in the preoperative area prior to surgery. The number of intensive care unit and ventilator days, need for transfusion, and transfusion requirements will be recorded as applicable. Appropriate medication administration will be evaluated in prospective patients.

Learning Objectives:
1. Describe the impact of a newly revised emergency department (ED) trauma order set that includes tranexamic acid on mortality in adult trauma patient 18 years of age and older with, or at risk for, trauma-related bleeding.
2. Identify the impact of tranexamic acid on the number of intensive care unit days, ventilator days, and the receipt of a blood transfusion.

Self Assessment Questions:
1. Which of the following is NOT true?
   a. Hemorrhage is the most common cause of death in patients who reach the hospital following a traumatic event.
   b. CRASH-2 and MATTERS are the two large studies that demonstrated efficacy in patients with trauma-associated hemorrhage.
   c. Tranexamic acid should be administered greater than three hours of the initial injury.
   d. Significant hemorrhage is defined as systolic blood pressure < 90 mmHg and/or heart rate > 110bpm
2. Which of the following is true?
   a. Tranexamic acid has the potential to decrease the number of intensive care unit days.
   b. Patients who receive TXA may spend more days on the ventilator.
   c. Tranexamic acid increases the need for receipt of a blood transfusion.

Q1 Answer: [C] Q2 Answer: [A]

KETAMINE FOR POSTINTUBATION SEDATION IN THE EMERGENCY DEPARTMENT. Stephanie A. Burton, Jeremy P. Hampton, Erin M. Pender, Truman Medical Center, Pharmacy Department, 2301 Holmes St., Kansas City, MO 64108. stephanie.burton@tmcmed.org

The primary objective of this study is to compare the effect of ketamine on the incidence of postintubation hemodynamic instability (PIHI) to other sedatives. A retrospective study demonstrated an increase in in hospital mortality, intensive care unit (ICU) length of stay (LOS), and hospital LOS in patients with PIHI. In contrast to other commonly used sedatives, ketamine preserves and often improves cardiac output making it an attractive agent for use in hemodynamically unstable patients or those at risk for hemodynamic instability.

Study data will be compared to historical data of hypotensive patients intubated in the emergency department during the same period of time in the previous year. Study group inclusion criteria include age greater than or equal to 18 years, endotracheal intubation in the emergency department, and ketamine utilized for postintubation sedation. Exclusion criteria include patients intubated prior to arrival. The primary outcome measure is the use of a vasopressor agent, MAP less than or equal to 65, or SBP less than or equal to 90 mmHg within the first sixty minutes following intubation. Secondary endpoints include the use of a vasopressor within ninety minutes of ketamine discontinuation and the use of and cumulative doses of fentanyl, morphine, hydromorphone, lorazepam, and midazolam administered in the emergency department following ketamine administration. Safety endpoints to be collected include the incidence of emergence reactions and hypertension.

The results of this study will be used to guide the future use of ketamine for sedation in mechanically ventilated patients in an effort to improve patient care.

Learning Objectives:
1) Identify patients that may safely benefit from sedation with ketamine

Self Assessment Questions:
1) Identify two disease states in which ketamine for postintubation sedation should be used with caution to avoid patient harm.

Q1 Answer: acute coronary syndrome and heart failure
Limited data is available to guide clinicians in the treatment of patients requiring reversal of non-hemophilic hemorrhage. For instance, oral anticoagulation agents are widely used to manage a variety of common conditions, however limited clinical data is available to guide clinicians towards the reversal of warfarin and target-specific oral agents (e.g. dabigatran, apixaban, rivaroxaban). Furthermore, there is even less data to support the use of reversal agents in patients with a hemorrhagic event secondary to liver disease. The use of a systematic approach to assess and treat these patients can help avoid delays that could adversely affect patient outcomes, however more studies are needed to evaluate currently available products.

The current study is an observational, multi-center, retrospective review of patients admitted to the University of Minnesota Medical Center, Fairview and Fairview Southdale Hospital who required administration of prothrombin complex concentrate for a non-hemophilic bleeding event. The objectives of the study were to evaluate patient outcomes, appropriateness and effectiveness of therapy, and adherence to algorithms available to medical staff at our institution for reversal of bleeding events.

Patients with a non-hemophilic acute bleeding event requiring the administration of a prothrombin complex concentrate from January 1, 2011 through May 31, 2014 will be included in this study. The primary outcome measures are the overall patient survival, time to control of bleeding, effect on coagulation parameters (PT, aPTT, Thrombin Time, INR), dose of reversal agent used, and adherence to the algorithms currently in use at these institutions.

**Learning objectives:**

1) Review the prescribing information for Kcentra™ to help guide when it should be used to manage non-hemophilic hemorrhage.

2) Describe the prescribing patterns of PCCs in patient’s requiring reversal of non-Hemophilic hemorrhage at our institution.

**Self Assessment Questions:**

1) Kcentra™ potency is defined in terms of Factor ___
   - A. II
   - B. VII
   - C. IX
   - D. X
   - E. All of the above

2) Kcentra™ is indicated for the urgent reversal of acquired coagulation factor deficiency induced by:
   - A. Vitamin K antagonist
   - B. Liver Disease
   - C. New oral anticoagulant agents
   - D. Hemophilia
   - E. All of the above

Q1 Answer: C  Q2 Answer: A
Hyperglycemia is known to be associated with adverse outcomes in hospitalized patients. Clinical guidelines for management of hyperglycemia in non-critical care patients have not been established leading to practice variability and suboptimal glycemic control in many patients. At Lawrence Memorial Hospital, medication orders and blood glucose monitoring parameters have not been standardized for hyperglycemic patients. The national benchmarks measured by the Glycemic Control Mentored Implementation (GCMI) program have supported the need to improve glycemic control at this site.

The purpose of this study is to evaluate the effectiveness of a multidisciplinary approach on improving glycemic control in non-critical care patients. This quality improvement project will be a pilot study spanning six months. Data will be collected in three phases: pre-intervention, physician only intervention, and physician plus pharmacist intervention. Education and daily patient glucose values will be provided for pharmacists on a multidisciplinary team to improve glycemic control. The results of this study will be used to further evaluate the role of pharmacists on a multidisciplinary team to improve glycemic control.

Learning Objectives:
1. Describe various measurements used to evaluate glycemic control

Self Assessment Questions:
1. Day-weighted mean (DWM) is defined as:
   A. Average of all glucose values taken during patient’s stay
   B. Average of all glucose values over the past three months
   C. Average of all glucose values taken per patient day
   D. Average of all glucose values per patient day divided by the length of patient stay

Q1 Answer: C

Diabetes mellitus is a complex, chronic disease process requiring meticulous monitoring and frequent medication titration to achieve hemoglobin A1c (HbA1c) levels of less than 7% in accordance with the evidence-based, guideline driven goal set forth by the American Diabetes Association (ADA). Evidence supports the positive impact of pharmacist medication therapy management in chronic disease states, such as diabetes. Data has consistently shown significant improvements in reduction of HbA1c in pharmacist managed diabetes care when compared to standard of care. The purpose of this quality improvement project is to evaluate pharmacist managed diabetes care compared to standard of care for all patients with a HbA1c greater than 9%.

The primary objective is to evaluate the change in HbA1c from baseline to one year (or date of discharge from clinic if less than one year) in patients with pharmacist managed care versus standard of care. The secondary objectives include evaluating the percentage of patients with a decrease in HbA1c of at least 1%, percentage of patients meeting pre-specified HbA1c goal, and percentage of patients on appropriate medications to prevent diabetes related complications as recommended by the ADA guidelines.

The objectives will be assessed through a retrospective chart review of diabetic patients managed by either clinical pharmacists or primary care providers. Data will be evaluated utilizing a Student t-test or Wilcoxon rank analysis for continuous data and a chi-squared analysis or Fisher’s exact test for categorical data.

The results of the project will be used to improve patient care and determine the appropriateness of implementing changes in the current consultation process for diabetic patients with HbA1c greater than 9% at the Veterans Affairs Nebraska-Western Iowa Health Care System.

Learning Objectives
1. Describe the impact of pharmacist intervention on diabetes care management.

Self Assessment Questions
1. Pharmacist managed diabetes care, when compared to standard medical care, showed:
   a. Additional benefits
   b. Improvement in HbA1c lowering
   c. Neutral HbA1c lowering
   d. Both A and B
   e. All of the above

Q1 Answer: D
USE OF GLUCOSE LOWERING DRUG CLASSES AND A1C AT INSULIN INITIATION

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The Omaha VA restricted the prescribing of nicotine gum or lozenges as monotherapy to providers associated with a tobacco cessation program in December 2008. This restriction has not been implemented at all Nebraska Western Iowa (NWI) sites due to variance in practice models and provider types which provide cessation services. Evaluating cessation results, associated with amount of follow up, for patients prescribed monotherapy with short-acting nicotine replacement (NRT) across all NWI sites may help determine if this restriction should be adopted across the system.

The primary objective of this project is to determine if monotherapy with nicotine lozenges or nicotine gum yields higher six month tobacco cessation rates with additional follow up care, compared to patients receiving no follow up. A key secondary objective is to assess the effectiveness of the smoking cessation questionnaire used in this study.

Objectives will be evaluated through chart reviews and a questionnaire completed by patients identified via retrospective pharmacy database search for released prescriptions of nicotine gum or nicotine lozenges during the study timeframe. An excel document has been developed to collect responses received from questionnaires and to document relevant chart review data. Data will be analyzed using descriptive statistics.

The results of this study will be used to standardize smoking cessation protocols for the prescribing of monotherapy NRT in an effort to improve patient-centered care throughout all NWI sites.

Learning Objectives:
1. Identify specific timeframes in which beneficial effects on the body are seen after quitting tobacco.
2. Discuss whether or not data supports an association between tobacco quit rates and follow up during smoking cessation treatment.

Self-Assessment Questions:
1. After what time period of being smoke free does the risk of a heart attack become equal to that of never-smokers?
   a. 6 months
   b. 1 year
   c. 2 years
   d. 5 years

2. Which of the following statements are correct in terms of association between tobacco quit rates and follow up according to this study?
   a. No association has been found between tobacco quit rates and follow up.
   b. The first follow up visit, subsequent an initial appointment, should be conducted after 6 months of smoking cessation treatment.
   c. Data shows that additional follow up (e.g. face-to-face contact; letters or telephone conversations; self-help materials beyond initial brief advice) significantly increases cessation success rates.
   d. Telephone counseling as a follow up method does not increase tobacco quit rates.

Q1 Answer: (b) Q2 Answer: (c)
Many acute care hospitals are focusing on improving patient safety during care transitions in order to decrease hospital readmission rates. Medication-related issues contribute to significant problems in these transitions, resulting in an opportunity for pharmacists to help improve the quality of patient care. Existing transitions of care models have limited the role of pharmacists to the inpatient setting. Since patient safety spans the entire continuum of care, further research is needed to assess the value of implementing community pharmacists in transition of care models.

The purpose of this study is to evaluate the effect of community pharmacist-managed transitions of care on 30-day hospital readmission rates for patients identified to be at high-risk for readmission according to the BOOST risk assessment tool. This objective will be assessed by examining participating patient’s 30-day readmission rates compared to the readmission rates of the same patients identified that the community pharmacist did not see over a 3-month period. The results of this study will be used to implement and expand the role of community pharmacists in transitions of care models in order to improve patient care and decrease hospital readmissions.

Learning Objective(s): Be able to describe the effect of community pharmacist-managed transitions of care on 30-day hospital readmission rates for patients identified to be at high-risk for readmission according to the BOOST risk assessment tool.

Self-Assessment Question(s): What effect did the community pharmacist-managed transitions of care have on 30 day hospital readmission rates?

(A) Patients that were seen by the community pharmacist had lower readmission rates than patients that were not seen
(B) Patients that were seen by the community pharmacist had higher readmission rates than patients that were not seen
(C) There was no difference in readmission rates

Answer to Self-Assessment Question(s): (A) Patients that were seen by the community pharmacist had lower readmission rates than patients that were not seen.

In 2010, the Veterans Health Administration began developing a tool to assist pharmacists in documenting interventions made during patient care appointments for a variety of disease states. The Pharmacists Achieve Results with Medication Documentation (PhARMD) Clinical Reminder Tool is expected to be a valuable resource in compiling both quantitative and qualitative evidence of the impact pharmacists have on improving the care of our veterans nationwide.

The primary objective is to evaluate the rate at which pharmacists at the Lincoln VA are utilizing the PhARMD Tool to record interventions during clinic visits over the pilot period. Secondary objectives are to quantify and describe the number and types of interventions recorded via the tool.

A retrospective review of encounter data recorded by pharmacists at the Lincoln VA via the PhARMD Tool during the pilot period of August 1, 2013 to January 31, 2014 was conducted. To determine the rate at which pharmacists are utilizing the tool during appropriate clinic visits, a separate report of all pharmacist encounters over the same period was compared against the number of visits recorded in the PhARMD Dashboard Summarv Data. The effectiveness of pharmacist follow-up education and training after introduction of the tool was evaluated by chart review of a random 20% sample. Trends in accurate usage of the tool were compared between the initial and final month of the pilot period.

The findings of this project will be shared with pharmacy leadership to determine if further education is necessary to improve utilization of the tool.

Learning Objectives:
1.) Describe the purpose of the PhARMD Clinical Reminder Tool.
2.) Explain how the results of this study will be used in clinical practice.

Self Assessment Questions:
1.) The PhARMD Clinical Reminder Tool’s purpose is to:
   A. Increase the time spent documenting encounters
   B. Decrease the number of staff positions needed to verify documentation is being done correctly
   C. Provide data regarding the positive impact pharmacists have on improving patient care
   D. Decrease the amount of time pharmacists must spend with patients

2.) The results of this study will be used to:
   A. Scold pharmacists who are using the tool incorrectly
   B. Determine if further education on proper use of the tool is needed
   C. Identify which pharmacists need to increase the amount of patients seen per day
   D. Recognize which pharmacists may be overworked due to an excessive number of patient encounters

Q1 Answer: C  Q2 Answer: B
V-GO INSULIN DELIVERY SYSTEM VS. MULTIPLE DAILY INSULIN INJECTIONS FOR PATIENTS WITH UNCONTROLLED TYPE 2 DIABETES MELLITUS, Abby Winter, Michaela Lintner, Emily Knezevich, Creighton University SPAHP, Alegent Creighton Clinic - Dundee, 5002 Underwood Ave, Omaha, NE 68132 abbywinter@creighton.edu

Studies have shown that more than 50% of patients with type 2 diabetes mellitus are uncontrolled (A1C > 7%). The V-GO is a newly developed insulin delivery system designed to release a set basal rate over a 24 hour period, while also allowing patients to provide bolus insulin as needed throughout the day. While some refer to it as a disposable insulin pump, the V-GO is a spring-loaded device containing only rapid-acting insulin that runs without the use of batteries or computer software. Due to its recent implementation into type 2 diabetes treatment, the V-GO has had few studies comparing it to other methods of standard basal-bolus insulin delivery.

The purpose of this study is to determine the A1C lowering effects of multiple daily insulin injections (MDI) compared to use of the V-GO insulin delivery device for patients with uncontrolled type 2 diabetes mellitus over a 3 month period. A secondary purpose is to determine the effect on insulin requirement for patients using the V-GO and MDI. The final purpose of this study is to assess the following secondary outcomes for all patients: weight, blood pressure control, prevalence of hypoglycemic events, and quality of life. The results of this study will be used to help influence initiation and use of the V-Go Insulin Delivery Device, and to improve patient care, patient outcomes, and patient satisfaction.

Learning Objectives:
1) Identify patients who may be good candidates for insulin administration with a V-Go and determine starting dosing instructions.
2) Explain the differences in potential outcomes between basal-bolus insulin administration with a V-Go versus multiple daily insulin injections.

Self-Assessment Questions:
1) A patient presents to your clinic stating he has been missing his insulin injections lately due to his dislike of multiple injections every day. He is currently taking 17 units of Lovenir twice daily and 6 units of Humalog three times daily with meals. You want to recommend this patient use a V-Go. What V-Go size would you recommend and how many clicks would you instruct the patient to use?
   a. V-Go 20, 2 clicks with each meal
   b. V-Go 30, 2 clicks with each meal
   c. V-Go 30, 6 clicks with each meal
   d. V-Go 40, 6 clicks with each meal
2) You are explaining the V-Go to a patient who is considering initiation. Which of the following is not a correct counseling point or expectation you would share with your patient?
   a. Decreased HgA1c
   b. Decreased insulin requirement
   c. Must be taken off to shower
   d. Must fill with rapid-acting insulin

Q1 Answer: B Q2 Answer: C

EVALUATION OF OUTPATIENT VITAMIN D REPLACEMENT STRATEGIES IN ADULTS: A RETROSPECTIVE REVIEW. Beau VanOverschelde, Kristin Stover, Avera McKennan Hospital and University Health Center, 1325 S. Cliff Avenue, Sioux Falls, SD 57117. beau.vanoverschelde@avera.org

Insufficient vitamin D levels are associated with an increased risk of osteoporosis, falls, and cancer. Multiple replacement regimens have been used in patients, particularly in the outpatient setting. Currently, no formal guidelines exist for the optimal dosing replacement regimen in this patient population.

The objectives of this study are to determine the efficacy of vitamin D replacement regimens to correct vitamin D insufficiency and analyze patient specific factors that may impact attaining vitamin D sufficiency.

This study was submitted to the Institutional Review Board and approved. A chart review of the electronic medical record for outpatients with an initial 25-hydroxyvitamin D (25(OH)D) level under 30 ng/mL and a subsequent 25 OHD level after vitamin D supplementation will be considered. The following data will be collected: patient age, gender, race, body mass index, 25(OH)D level, vitamin D regimen used, serum creatinine, osteoporosis diagnosis, and date levels collected. All data will remain confidential and without patient identifiers. Patients will be excluded if there is no documentation for vitamin D use; they have only one 25(OH)D level; or they are under the age of 18. Average increase in serum 25(OH)D will be calculated and whether or not the replacement regimen achieved vitamin D sufficiency (defined as 25(OH)D level greater than 30 ng/mL). Patient characteristics will also be analyzed for their influence on adequate vitamin D replacement.

The results of this study will be used to formulate a template to guide physicians in vitamin D replacement at Avera McKennan Internal Medicine.

Learning Objective:
1.) Define vitamin D insufficiency

Self Assessment Questions:
1.) Vitamin D insufficiency is defined as?
   a. 25(OH)D level <40 ng/mL
   b. 25(OH)D level <30 ng/mL
   c. 25(OH)D level <20 ng/mL
   d. 25(OH)D level <10 ng/mL

Q1 Answer: B
Hospital readmissions have become a marker for quality health care. Excessive readmissions can indicate poor clinical care and poor transitions of services either during hospitalization or post discharge. The Affordable Care Act added a section to the Social Security Act establishing the Hospital Readmissions Reduction Program, which requires Centers for Medicare & Medicaid Services (CMS) to reduce payments to acute Inpatient Prospective Payment System (IPPS) hospitals with excess readmissions.

Medication related problems are a documented cause of hospital readmissions. A medication or drug related problem is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes. This can occur at any point from admission to readmission.

Medicare readmission penalties for 2013 affected four of the five Houston Methodist Hospitals. This prospective analysis will help describe the amount of readmissions due to any medication related event at Houston Methodist Hospital (HMH). The objective of this study is to describe the rate and type of readmissions within 60 days due to medication related events using the Pharmaceutical Care Network Europe (PCNE) Classification. This study will also look at the type of medication events, classify the medications based on World Health Organization (WHO) ATC/DDD Index, and determine the level of pharmacist involvement in patient care. This data will help guide efforts to reduce readmissions due to medication related events. A total of one hundred patients were recruited, and data is currently being analyzed.

Learning Objective:
1.) Describe medication related readmissions using the Pharmaceutical Care Network Europe (PCNE) Classification.

Self Assessment Question:
1.) The most common problem of medication related events seen in this study was:
   a. Treatment effectiveness
   b. Adverse reactions
   c. Treatment costs
   d. Usually unclear

Q1 Answer: A

Many disease states today require short or long term anticoagulation with warfarin. Warfarin should be monitored every four to six weeks to ensure anticoagulation is maintained in the therapeutic range. In the past, patients have been required to have blood drawn through a venipuncture to determine their anticoagulation level. Technological advances have developed monitors which require only a small amount of blood from a fingerstick to determine anticoagulation in a patient, which is known as point-of-care testing. These monitors offer many advantages including results in a few minutes and a single fingerstick to obtain a sample of blood. Furthermore, these monitors facilitate the ability of institutions to organize coumadin clinics and provide more effective monitoring of anticoagulation.

The purpose of this study is to determine patient preference between traditional lab draws via venipuncture, conducted by a phlebotomist, and point-of-care testing via the Coagucheck-S monitor, conducted by a clinical pharmacist. A secondary purpose is to assess patient satisfaction with the services provided through an anticoagulation clinic. A final purpose of the study is to assess patient appointment adherence factors.

These objectives will be assessed through a questionnaire completed by patients in a pharmacist-managed anticoagulation clinic. Descriptive statistics will be calculated and chi-square analysis will be conducted to compare groups.

The results of the study will be used to implement changes in the UAMS Anticoagulation Clinic to improve patient care and patient satisfaction in the clinic.

Learning Objectives:
1.) Describe the impact of the effects of a newly developed comprehensive DKA and HHS order set.

Self Assessment Questions:
1.) The development of an emergency hyperglycemia protocol may result in:
   a. Increased time to anion gap closure
   b. Reduction of hypokalemia within 24 hours of admission
   c. Reduction of length of inpatient hospital stay
   d. B & C

Q1 Answer: D
In many observational studies, confounding is addressed using variables that indicate the presence of disease (ICD-9 codes). These codes, however, do not include information regarding the severity of that disease. Residual confounding could result in an over or under estimate of the true effect size. As an example, an analysis using Medicare data reported that rural patients with acute myocardial infarction (AMI), congestive heart failure (CHF), or pneumonia had poorer survival rates compared to urban patients. The authors were unable to control for differences in disease severity. The purpose of this study was to investigate whether differences in disease severity exist between rural and urban patients with the same diagnosis.

This retrospective chart review compares disease severity between patients admitted to rural hospitals and an academic medical center with a principal diagnosis of CHF or cellulitis. Disease severity was measured using the Comprehensive Severity Index (CSI). Severity criteria measured by the CSI are disease-specific and their values to compute CSI depend on the extent of abnormality of the physiologic-based signs, symptoms, and physical findings relevant to each of a patient’s ICD-9-CM codes.

The urban sample consisted of 25 patients for each disease state. The rural sample was collected over the same time period at eight critical access hospitals as part of a separate study. Differences in severity will be evaluated using the t-test or Wilcoxon rank sum test, depending on the normality of the data. The chi-square test will be used to evaluate differences in obesity and smoking status.

Learning Objective:
1.) Describe the Comprehensive Severity Index (CSI) and its use for measuring disease severity.

Self Assessment Question:
1.) Which of the following is entered into the Comprehensive Severity Index to trigger questions related to disease severity?
   A. Primary diagnosis
   B. All ICD-9 codes billed for during hospital stay
   C. Glasgow Coma Scale (GCS) Sore
   D. Injury Severity Score (ISS)

Q1 Answer: B
ASSESSMENT OF GLYBURIDE-ASSOCIATED HYPOGLYCEMIC EVENTS IN HOSPITALIZED PATIENTS WITH RENAL INSUFFICIENCY. Yunlu Chen, Valerie Smith, Amy Carlson, University of Kansas Hospital, 3901 Rainbow Boulevard, Mailstop 4040, Kansas City, Kansas 66160. ychen@kumc.edu

The American Diabetes Association and the American Association of Clinical Endocrinologists guidelines recommend second generation sulfonylureas as adjunct therapy in patients failing to achieve hemoglobin A1c goals with monotherapy. However, sulfonylureas are associated with an increased risk of hypoglycemia and related adverse drug events. Among the three agents most commonly used (glipizide, glimepiride, glyburide), glyburide has the highest risk of hypoglycemia in renal insufficiency. Consequently, glyburide is not recommended in patients with a creatinine clearance (CrCl) <50 mL/min.

The primary objective of this study is to assess the incidence of hypoglycemia prior to the implementation of electronic order help text in patients with CrCl <50 mL/min. Patients will be separated into 2 groups: CrCl >50mL/min and CrCl <50mL/min. Secondary objectives will include appropriateness of therapy based on renal function, presence of endocrine consult, glyburide discontinuation secondary to renal insufficiency, number of patients who continue glyburide despite a CrCl <50 mL/min, and the patient’s medical service during admission. A retrospective chart review including documented glyburide administration in all hospitalized patients will be performed from June 1 to December 1, 2013.

The results of this study will serve as baseline data to determine if order help text implementation is effective in directing appropriate prescribing habits in patients with renal dysfunction, as well as determine the need for targeted education to ensure appropriate glyburide use.

Learning Objective:
1.) Recognize patient populations who may be at risk of glyburide induced hypoglycemia and provide appropriate recommendations in clinical practice.

Self-Assessment Question:
1.) In which patient example below would the use of glyburide be most inappropriate?
   a. A 36 year old male who prefers only oral diabetes medications, and did not achieve target HbA1c on metformin alone
   b. A 45 year old male with a CrCl of 84 mL/min
   c. A 29 year old female with gestational diabetes and no other comorbidities
   d. A 79 year old female with end-stage renal disease

Q1 Answer: D

INCIDENCE OF CARDIOVASCULAR AND BLEEDING EVENTS AND THE ASSOCIATED COST OF P2Y12 INHIBITORS IN PATIENTS WITH EXTENDED DURATION DUAL ANTIPLATELET THERAPY AFTER DRUG ELUTING STENT PLACEMENT. Rachel Coleman, Xuan Nguyen, R. Spencer Schaefer, Kansas City Veterans Affairs Medical Center, 4801 Linwood Blvd (119), Kansas City, MO 64128. Rachel.Coleman2@va.gov

Current recommendations on the duration of dual anti-platelet therapy (DAPT) following the placement of drug eluting stents (DES) differs among the guidelines. The paucity of data has resulted in many patients receiving DAPT indefinitely. Additionally, the risk-benefit ratio of the duration of use of DAPT is not well supported in current literature.

The objective of this retrospective study is to evaluate Veterans within the Kansas City Veterans Affairs Medical Center (KCVAMC) between January 1, 2007 and December 31, 2012 who had a DES placed as a result of a non-ST elevation myocardial infarction, ST-elevation myocardial infarction, or unstable angina and were prescribed and took DAPT with a P2Y12 inhibitor and aspirin continuously for at least 12 months. The primary outcome is to determine the rate of recurrent cardiovascular events (in-stent thrombosis, myocardial infarction, unstable angina, stroke, transient ischemic attacks, and all-cause mortality). The financial burden, determined through pharmacy acquisition cost, for the use of P2Y12 inhibitors indefinitely in this population will be assessed as the secondary outcome. Additionally, the safety outcome will determine the incidence of bleeding events as defined by the Thrombolysis in Myocardial Infarction bleeding criteria for major and minor bleeds. The Veterans Affairs Informatics and Computing Infrastructure will be utilized to extract the data and descriptive statistics will be used for analysis of the outcomes. It is predicted that potential outcomes from this study may influence the prescribing practice of DAPT after a DES placement at the KCVAMC.

Learning Objective:
1) Recognize the prescribing patterns of dual anti-platelet therapy post drug eluting-stent placement and the resulting incidence rate of complications (cardiovascular and bleeding) at the Kansas City Veterans Affairs Medical Center.

Self-Assessment Question:
1) The definition of recurrent cardiovascular events comprised what events?
   A. Myocardial infarction, coronary artery bypass graft, in-stent thrombosis, stroke, transient ischemic attack, all-cause mortality
   B. Myocardial infarction, coronary artery bypass graft, in-stent thrombosis, cardiovascular mortality
   C. Myocardial infarction, in-stent thrombosis, unstable angina, stroke, transient ischemic attack, and all-cause mortality
   D. Myocardial infarction, in-stent thrombosis, unstable angina, stroke, transient ischemic attack, and cardiovascular mortality

Q1 Answer: C
Intravenous heparin is widely used as an anticoagulant for the treatment of acute coronary syndromes (ACS) and venous thromboembolism (VTE). The anticoagulant effect of heparin is monitored using activated partial thromboplastin time (aPTT). Therapeutic aPTT range varies with the particular laboratory instrumentation and reagents used for testing. Historically, practices have used fixed doses of heparin, but studies have shown weight-based nomograms to be superior in achieving the therapeutic aPTT in a shorter period of time. The objective of this study will be to evaluate the effectiveness of and compliance with CUMC’s weight-based heparin protocols and the time needed to achieve therapeutic aPTT.

This will be a retrospective cohort study of patients ≥ 19 years of age admitted to CUMC from July 2012 through June 2013 with intravenous (IV) heparin therapy for longer than 24 hours for treatment of VTE or ACS. Patients started on IV heparin at CUMC using the protocols will be eligible. Data collected includes: demographics, information regarding hospitalization, and heparin therapy and monitoring according to protocols. Patients excluded from this study will include age <19 years old, IV heparin initiated outside of CUMC, use of subcutaneous heparin for DVT prophylaxis, use of CUMC’s Low Intensity Heparin Infusion protocol and use of IV heparin < 24 hours.

The results of this study will be presented at CUMC’s anticoagulation subcommittee of Pharmacy and Therapeutics Committee.

Learning Objectives:
1. Describe the importance of using weight-based nomograms to achieve aPTT

Self-Assessment Question:
1. Weight-based nomograms have shown to:
   a. achieve aPTT in a shorter period of time
   b. increased length of stay
   c. no advantage compared to fixed dosing
   d. more recurrence of VTE

Answer: A
Comatose adult patients with return of spontaneous circulation after cardiac arrest are treated with induced hypothermia (IH) to improve neurologic outcomes. Many complications are associated with IH including hyperglycemia, electrolyte disturbances, bleeding, shivering, thrombocytopenia, leukopenia, pyrexia after rewarming, and infections.

The purpose of this study is to investigate the association between induced hypothermia (IH) and the incidence of thrombocytopenia, leukopenia, and pyrexia, and the time for parameters to return to pretreatment levels. Secondary objectives include determining the incidence of bacterial infections and rates of antimicrobial usage.

A single-center retrospective cohort analysis of adult survivors of cardiac arrest treated with IH (after exclusions, n=28) from 2009 to 2013 was performed. Serial measurements of platelets, white blood cells, and temperature were assessed for 7 days after the (IH) protocol was completed. Bacterial infections were confirmed with cultures and radiographs.

Thrombocytopenia, defined as platelets <150,000/mL, occurred in 68% of patients. Platelets declined an average of 36% and returned to pretreatment levels within 4 days. 81% of patients experienced a decline in WBC count of >40%. Pyrexia (temperature ≥38°C) after rewarming occurred in 82% of patients, with patients becoming afebrile within 24 hours of rewarming on average. The radiographic and culture confirmed infection rate was 60%. Twenty-five percent of febrile patients treated with antibiotics did not have confirmed infections.

Thrombocytopenia, decreased WBC count, and pyrexia are common after IH. Pyrexia after IH is not always associated with infection, and may lead to overdose of antibiotics.

Learning Objectives:
1.) Discuss the effects of induced hypothermia on hematologic parameters.
2.) Describe fluctuations in body temperature that may occur after the induced hypothermia protocol is completed and the patient is rewarmed.

Self Assessment Questions:
1.) Which of the following statements is correct regarding the effects of induced hypothermia on hematologic parameters?
   A. Induced hypothermia never causes a change in platelet and white blood cell counts.
   B. Induced hypothermia always causes thrombocytopenia and neutropenia.
   C. Induced hypothermia frequently causes the platelet count to rise and the white blood cell count to decline.
   D. Induced hypothermia frequently causes a drop in platelet and white blood cell counts.

Answer: C

2.) Which of the following statements is most correct regarding fluctuations in body temperature following induced hypothermia and rewarming?
   A. Body temperature always remains within normal limits after the body is rewarmed.
   B. Body temperature frequently declines below 37°C during the first day after rewarming.
   C. Fevers are common during the first 48 hours after rewarming and are always indicative of infections.
   D. Fevers are common during the first 48 hours after rewarming and are not always indicative of infections.

Answer: D

Q1 Answer: D  Q2 Answer: D
Postoperative delirium occurs in 14-65% of surgical patients over the age of 65 and can lead to devastating outcomes that affect patients, family members, and the healthcare system. Delirium has been strongly associated with increased morbidity and mortality, higher costs of care, prolonged hospital stay, reduced quality of life, and decreased functional status after discharge. Multicomponent interventions are the most effective means to prevent delirium and should be implemented with support from a multi-disciplinary team. Pharmacists play a vital role in the prevention of delirium in postoperative elderly patients through medication profile reviews and recommendations of safe and effective treatments.

The primary objective of this study is to implement and assess pharmacist interventions for prevention and management of delirium in postoperative patients over the age of 65. Secondary objectives include the evaluation and impact of pharmacist interventions on 30-day readmission rate and cost per patient day.

The study will be completed in two phases. Phase one will be a retrospective chart review of postoperative patients over the age of 65 identified with delirium. Data collection will include patient demographics, indication for surgery, 30-day readmission rate, and cost per patient day. Phase two will be a prospective implementation and evaluation of pharmacy services. Data will be measured using descriptive statistics and will be compared between the two phases.

The results of the study will be utilized to further expand pharmacy clinical services and optimize patient outcomes and safety following surgical procedures.

**Learning Objective:**
1. Recognize the etiology and pathophysiology of delirium as it relates to medication use.

**Self-Assessment Question:**
1. Which of the following medications is least likely to cause delirium?
   A. Prednisone
   B. Atropine
   C. Propofol
   D. Clonidine

Q1 Answer: D

**EVALUATION OF AN UPDATED ORDER SET TO PROMOTE ANALGESIA-FIRST SEDATION, MINIMIZE BENZODIAZEPINE USE, AND TARGET LIGHTER SEDATION IN MECHANICALLY VENTILATED ICU PATIENTS.**

Analgesia and sedation are important components of care for mechanically ventilated patients in the intensive care unit (ICU). The updated 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit recommend using analgesia-first sedation, minimizing the use of benzodiazepines for sedation, and targeting lighter levels of sedation. These strategies have been shown to improve clinical outcomes including improved pain management, shortened duration of mechanical ventilation, and a reduction in length of stay and incidence of delirium in mechanically ventilated ICU patients.

An existing analgesia and sedation order set for mechanically ventilated patients was updated by an interdisciplinary team based on the three strategies in the new guidelines. The primary objective of this study is to evaluate analgesia and sedation practice in mechanically ventilated patients by examining prospective and retrospective endpoints. Primary endpoints include the use of analgesia-first sedation, the use of benzodiazepines for sedation, and average RASS scores. Secondary endpoints include time on the ventilator, ICU length of stay, hospital length of stay, and the frequency of order set usage. The endpoints will be compared before and after order set revision and implementation.

The results of this study will help assess the impact of an updated analgesia and sedation order set at our institution. Aligning analgesia and sedation practice with the most current evidence-based guidelines provides a roadmap for improving patient outcomes.

**Learning Objective:**
1. Describe pharmacological sedation strategies recommended in the 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit (2013 SCCM PAD guidelines)

**Self-Assessment Question:**
1. Pharmacological strategies recommended in the 2013 SCCM PAD guidelines include which of the following:
   A) Analgesia-first sedation
   B) Antipsychotics for the prevention of delirium
   C) Benzodiazepines as first line for sedation
   D) Both A and B

Answer: A
DIABETES MANAGEMENT IN A VETERAN POPULATION WITH SEVERE MENTAL ILLNESS REQUIRING AN ATYPICAL ANTPSYCHOTIC. Allison Schmitz, Pamela Wolf, Melissa Rohrich, William Newman. Fargo VA Health Care System, 2101 Elm Street North, Fargo, North Dakota, 58102. Allison.Schmitz@va.gov

The objective of this study is to analyze if clinicians are optimally managing diabetes in patients with psychotic and bipolar spectrum disorders treated with atypical antipsychotics.

Patients living with severe mental illnesses suffer not only from psychiatric diseases, but also in many cases from numerous physical comorbidities such as type II diabetes mellitus. Diabetes is ominously more prevalent in schizophrenia and bipolar disorders than in the general population. Researchers believe the increased diabetes prevalence is likely multifactorial including the impact of the illness itself, associated metabolic side effects of atypical antipsychotics, sedentary lifestyle, poor diet and limited access to quality healthcare. This patient demographic is also notorious for poor medication compliance and socioeconomic issues making the delivery of quality healthcare a challenge. Most published research focuses on the risk of developing diabetes in patients treated with atypical antipsychotics, but is lacking in those with established diabetes. Although the epidemiology between severe mental illnesses and diabetes mellitus type II has yet to be fully understood, the link between the disease states is indisputable.

This retrospective study evaluated diabetes management in patients with psychotic and bipolar spectrum disorders prior to and following the initiation of an atypical antipsychotic. The primary endpoints compare hemoglobin A1c, blood pressure, and low density lipoprotein cholesterol before and after the initiation of an atypical antipsychotic.

Study data will assist in further improving diabetes management in individuals with severe mental illnesses and in facilitating the coordination of care between primary care and mental health clinicians.

PHARMACIST’S ROLE IN REDUCING PSYCHIATRIC READMISSION BY PERFORMING MEDICATION COST-SAVING INTERVENTIONS. Sara Shuster, Kevin Berg, St. Luke’s Hospital, 915 E 1st st., Duluth, MN 55805 sara.shuster@slhduluth.com

In October 2012, hospitals began receiving reduced payments from Centers for Medicare and Medicaid Services (CMS) for excess readmissions. One suspected reason for psychiatric readmission is poor medication compliance due to lack of access to affordable medications. The purpose of this study was to determine if pharmacist involvement in psychiatric discharge planning could decrease 30-day readmission rates by providing assistance in finding avenues for medication affordability. A secondary objective was to determine the average potential cost savings per patient.

This quasi-experimental study compared 30-day psychiatric readmission rates pre-intervention versus post-intervention. Retrospective analysis determined the pre-intervention 30-day readmission rate to be 10.44% (n=134) for patients admitted between October-November 2012. For patients enrolled in the study between October-November 2013 (n=39), pharmacists made recommendations on less expensive medication alternatives and alerted the physician if a medication required prior authorization. If a patient lacked health insurance, the pharmacist helped enroll the patient in patient assistance programs or provided them with prescription coupons. Data was analyzed to determine whether pharmacist interventions impacted the institution’s psychiatric readmission rates and/or reduced financial burden for patients. Preliminary statistical analysis determined that pharmacist interventions led to a 26% reduction in 30-day readmission rates (10.44% vs 7.69%) and that patients saved an average of $104/month on their medications. Patients saved an average of $269/month if they had no insurance, $97/month if they had private insurance, and $0/month if they had government insurance. Pharmacist involvement may have a positive impact on reducing hospital readmission and reducing financial burden for patients.

Learning Objective:
1.) List potential medication cost-saving interventions.

Self Assessment Question:
1.) Which of the following could result in financial burden to the patient?
   A. A provider filling out a prior authorization form and faxing it to the patient’s pharmacy.
   B. Changing the patient’s medication to an alternative on a generic $4 prescription program.
   C. Changing to a brand name manufacturer with an assistance program with 100% coverage.
   D. Sending a patient with no insurance to the nearest geographic pharmacy for patient convenience.

Q1 Answer: D
Patients with serious mental illness (SMI) have increased cardiovascular risk and decreased life expectancy compared to the general patient population. Second generation antipsychotics (SGAs) are often first line therapy in patients with SMI. However, use of these medications increases the risk of metabolic complications. According to the literature, monitoring and treatment of these complications has historically been poor, resulting in decreased quality of care and poor treatment outcomes for this patient population. The purpose of this project is to facilitate appropriate monitoring and treatment of metabolic syndrome in patients with SMI.

This project was approved by the Institutional Review Board as a quality improvement project. Medical records were reviewed for SMI patients receiving SGAs to assess monitoring and management of metabolic abnormalities. Interventions were suggested to patients’ primary care physicians to optimize metabolic management, including dose adjustments, initiation or discontinuation of drug therapy, laboratory monitoring and referral to other services. One such service was longitudinal metabolic management by pharmacy residents within the mental health clinic. Patients were managed in accordance with Adult Treatment Panel III; the Consensus Statement on Antipsychotic Drugs and Obesity and Diabetes drafted jointly by the American Diabetes Association and the American Psychiatric Association; Veteran’s Affairs and Department of Defense guidelines; and primary care physician input. Measured quality improvement outcomes included number of pharmacist-driven interventions, intrapatient changes in metabolic syndrome components, and provider satisfaction.

Results are forthcoming but anticipated to support the continuation of a pharmacist run metabolic clinic in SMI patients.

Learning Objective:
1) Review recommendations for monitoring and treatment of metabolic abnormalities commonly associated with second generation antipsychotic use.

Self Assessment Question:
1) Following initiation of a SGA, when should a patient be seen for follow-up of metabolic monitoring?

Q1 Answer: Four weeks from therapy initiation

ASSESSMENT OF OUTCOMES IN VA PATIENTS WITH POORLY CONTROLLED DIABETES MELLITUS: A RETROSPECTIVE STUDY OF THE IMPACT OF A PHARMACIST-RUN CHRONIC DISEASE MANAGEMENT CLINIC. Elizabeth Berland, Kyleigh Gould, Danielle Backus, and Micah Halton, VA Eastern Kansas Healthcare System, Colmery O’Neil VA Medical Center, 2200 SW Gage Blvd, Topeka, KS 66622. elizabeth.berland@va.gov

Diabetes is a major risk factor for heart disease and stroke, and can lead to both macro and microvascular complications. The pharmacist-run chronic disease management (CDM) clinic is designed to improve diabetes outcomes through intensive lifestyle and medication interventions in conjunction with regular primary care follow-up.

The purpose of this study is to evaluate the effectiveness of pharmacist management on glycemic control in patients with poorly controlled type 2 diabetes mellitus (hemoglobin A1C >9%) versus like patients managed solely by primary care.

The primary outcome measure for this study is the change in A1C values for patients followed in pharmacist-run clinics compared to those managed solely by their primary care provider. Secondary outcome measures include changes in blood pressure and LDL. Data will be obtained retrospectively from a VA central database. Study findings will be analyzed using descriptive statistics, t-tests, and ANOVA.

We anticipate that results will show an improvement in measures of glycemic control with those referred to pharmacist-run clinics compared to those managed solely by primary care.

Learning Objectives:
1) Describe the role of pharmacist-run CDM clinics in diabetes management.

Self-assessment Questions:
1) Pharmacist-run CDM clinics are designed to:
a. Replace primary care
b. Provide intensive interventions to improve patient outcomes
c. Follow patients who successfully self-manage their diabetes
d. Provide basic diabetes education to patients

Q1 Answer: b
Hyperlipidemia, along with other factors such as hypertension, diabetes, and smoking, is linked to myocardial infarction, stroke, coronary artery disease, and death. However, pharmacists have been shown to have a positive impact on outcomes related to the management of these chronic diseases. At the Eastern Kansas VA, primary care providers (PCP) commonly refer patients to a pharmacist-run CDM clinic for management of these conditions, including hyperlipidemia.

The purpose of this study is to assess the effectiveness of CDM clinics versus usual care, management solely by a PCP, for hyperlipidemia. The primary objective is to evaluate the percent reduction in LDL and percentage of patients at LDL goal of <100 mg/dL, utilizing the goals presented in previously published literature. Secondary objectives include time to goal LDL, change in smoking status, and percentage of patients at goal blood pressure.

Patients included in the study were 18-80 year old veterans with a visit to CDM or PCP from 8/1/2009-8/1/2011 who met qualifications for an LDL goal of <100 mg/dL per ATP 3 guidelines, were diagnosed with hyperlipidemia, and had an LDL >130mg/dL at the initial PCP or CDM appointment. The VINCI database was utilized to compile patient data. Baseline characteristics will be analyzed via descriptive and Chi Square statistics, and the primary/secondary outcomes via ANOVA and Fischer's exact test. Secondary outcomes will be assessed with Χ² tests in addition to descriptive statistics.

The data will be used to evaluate the effectiveness of pharmacist-run CDM clinics versus usual care toward achieving LDL reduction at the VA of Eastern Kansas.

Learning Objective:
1. Describe the impact of utilizing pharmacists as a team member for chronic disease management

Self-Assessment Question:
1. How can pharmacists utilize their expertise to uniquely provide additional aid with hyperlipidemia management when consulted by PCPs?
   a. See the patient frequently to encourage adherence to medication regimens and lifestyle modifications
   b. Provide patient-specific counseling on the benefits of statin therapy in chronic disease states
   c. Utilize non-statin lipid-lowering medications to reach LDL goals
   d. A and B

Answer: D

Lipoprotein(a) [Lp(a)] is a low-density lipoprotein (LDL). Many studies have shown that high Lp(a) is linked with some cardiovascular disorders. While the exact role of Lp(a) in increasing cardiovascular risk is not fully understood, it is known to deposit at sites of vascular injury and bind to foam cells. While niacin has been shown to lower Lp(a) levels by 20-30%, specific dosage recommendations for niacin used to lower Lp(a) vary greatly. The few studies that are available used doses ranging from 1000 to 4000 mg daily. The FDA recommended dose of niacin is 500 to 2000 mg daily. However, there are currently no controlled trials to assess whether Lp(a) lowering improves cardiovascular outcomes.

The primary outcome of this study is to compare the number of patients who reached goal Lp(a) level while receiving FDA-approved vs. high-doses of niacin. The secondary outcomes of this study included differences in adverse effects, discontinuation rates, and overall reduction of Lp(a) levels.

These objectives will be assessed through retrospective chart review of patients receiving niacin treatment for elevated Lp(a) levels. The primary outcome will be evaluated with Fischer's exact test. Secondary outcomes will be assessed with X², Fischer's exact test, and t-tests in addition to descriptive statistics.

The results of the study will be used to evaluate local practices of prescribing high-dose niacin to treat elevated Lp(a) levels and improve patient care.

Learning Objectives:
1.) Recognize the role of niacin in the treatment of elevated lipoprotein(a) levels.

Self Assessment Questions:
1.) American guidelines on the treatment of elevated lipoprotein(a) levels recommend what dose of niacin therapy?
   a. 1000-3000 mg
   b. 500-2000 mg
   c. >2000 mg
   h. There are no American guidelines for treatment of elevated lipoprotein(a).

Q1 Answer: d
METFORMIN USE AND VITAMIN B12 SCREENING FOR PERIPHERAL NEUROPATHY

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Provision of optimal care is an essential component of Veteran-centered care. The objectives of this evaluation are to assess the existing process of supportive care management in patients who receive chemotherapy and to optimize current practices to improve the Veterans’ experience. Coordination and administration of supportive care medications will be areas of focus. By implementing change, the Veteran may experience decreased time spent in clinic with equivalent clinical outcomes.

This project is a quality improvement assessment and was reviewed and approved by the Chief of Staff, Chief of Pharmacy, and Pharmacy and Therapeutics Committee. Current supportive care practices will be assessed to identify treatment plans that default to intravenous supportive care medications. Veterans receiving these regimens will be evaluated for opportunity to switch to oral anti-emetics by a clinical pharmacist, and an automatic switch to oral products will be made, if appropriate. Following conversion from intravenous to oral therapy, a chart review will be completed to recognize changes in supportive care medication use (i.e. increased refills), identify patients who switch back to intravenous anti-emetics with future cycles of chemotherapy, evaluate time saved using procedure time information, and determine if delayed emesis was assessed via a phone call by nursing staff one and five to seven days after chemotherapy using a validated anti-emesis questionnaire. Pharmacy and nursing satisfaction of the switch from IV to oral supportive care medications will be assessed by survey. Cost and resource avoidance including nursing, pharmacy, and facility parameters will also be monitored.

Learning Objective:
1. Identify patients undergoing intravenous chemotherapy who are appropriate for oral supportive care medications.

Self-Assessment Question:
1. In which of the following scenarios would the use of oral supportive care medications NOT be appropriate?
   a. Patient is receiving cisplatin-containing chemotherapy.
   b. Patient is receiving treatment for head and neck cancer and is having trouble swallowing.
   c. Patient is receiving cyclophosphamide-containing chemotherapy.
   d. Patient is receiving vincristine-containing chemotherapy.

Q1 Answer: B

Metformin therapy has been reported to result in vitamin B12 deficiency, presenting with similar neurologic symptoms to diabetic neuropathy. It is essential to evaluate vitamin B12 levels in patients receiving chronic metformin therapy before patients are prescribed new medications for neuropathic symptoms. The goal of this study is to determine the proportion of Veterans Administration (VA) patients receiving continuous metformin therapy that have been screened for vitamin B12 deficiency within twelve months of peripheral neuropathy diagnosis. It will assess the timing of vitamin B12 screening in relation to the diagnosis of peripheral neuropathy and determine the proportion of patients receiving a new gabapentin prescription without vitamin B12 screening.

Data will be collected from the VA Informatics and Computing Infrastructure (VINCI) between the dates of July 1, 2003 and June 30, 2013. VINCI provides access to integrated national data sets including lab, disease and pharmacy data in a secure computing environment. A descriptive analysis of the data will be completed to assess the study objectives.

The results of this study will be used to increase awareness to physicians and pharmacists of metformin-associated vitamin B12 deficiency and the number of patients with potentially unnecessary medication prescriptions. The information may assist in evaluating the need for implementing educational and safety interventions across the VA medical centers, such as medication order entry and order verification flags. Finally, these results will also assist in evaluating potential unnecessary prescription drug costs and pill burden, both of which decrease medication adherence in an area pharmacists intervene.

Learning Objectives:
1) Identify the estimated risk of developing decreased vitamin B12 levels associated with metformin use.
2) Review the 2013 American Diabetes Association recommendations for vitamin B12 level screening.

Self-Assessment Questions:
1) According to the 2013 American Diabetes Association recommendations, how often should vitamin B12 levels be assessed in patients receiving metformin therapy?
   a. Annually
   b. Every 3-5 years
   c. Consider in patients with severe neuropathy

Answers: Q1) C     Q2) C
IMPROVING POINT OF CARE LACTATE TEST UTILIZATION IN SEPTIC PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT. David Huhtelin, Jace Knutson, Ashley Harbison, Seamus Murphy, Chad Cannon, The University of Kansas Hospital, 3901 Rainbow Boulevard, Mailstop 4040, Kansas City, Kansas 66160 dhuhtelin@kumc.edu

It is estimated that over 571,000 patients a year are brought to the emergency departments of US hospitals with sepsis. Among these patients, 20 to 50 percent of them will not survive. Early recognition and treatment are imperative to improving patient outcomes. Serving as a surrogate marker for hypoperfusion, blood lactate level is used to help define severity of sepsis and predicted mortality.

The University of Kansas Hospital has implemented a point of care (POC) lactate protocol in the emergency department in order to obtain levels earlier than previously able. However, data from phase one of this study failed to show a significant difference in time to lactate compared to previous means of analysis. In light of the results, it was determined that further investigation is warranted to identify and address potential barriers that may hinder use. The main focus of these efforts revolved around staff education and promoting awareness related to sepsis and POC lactate testing. The primary objective of phase two is to compare pre and post education data including the length of time between the patient’s arrival and initiation of broad-spectrum antibiotics, average time to lactate level result, and the percentage of patients meeting benchmarks set by the Surviving Sepsis Campaign. Data is obtained via retrospective chart review of medical records.

Learning Objectives:
1.) Review the analysis of the implementation of POC lactate testing in the ED and any correlation in achievement of sepsis benchmarks

Self Assessment Questions:
2.) The purpose of implementing a point of care lactate test in the emergency department is to:
   a. triage patients when the emergency department is full
   b. aid in recognizing severity of sepsis and initiating treatment
   c. decrease time and cost of having the laboratory running samples
   d. identify which antibiotics to begin in a septic patient

Q1 Answer: B

A RETROSPECTIVE REVIEW OF HIGH-DOSE ERTAPENEM AT AN ACADEMIC MEDICAL CENTER. Jareb Stallbaumer, Dana Hawkinson, Amber Sawyer, Lucy Stun, The University of Kansas Hospital, 3901 Rainbow Boulevard, Mailstop 4040, Kansas City, Kansas 66160 jstallbaumer2@kumc.edu

Obesity, which is increasing in incidence, has been shown to be associated with higher rates of morbidity and mortality in patients with critical illnesses and infectious conditions. Inadequate antimicrobial dosing is a potential explanation since adult body weight measures are typically not accounted for in regimen selection. Few pharmacokinetic evaluations investigating antimicrobial disposition in obese patients are available. Ertapenem, a Group 1 carbapenem, is an attractive agent for use in a broad range of infections. However, recent data suggest that the labeled dose of ertapenem for patients with adequate renal function (1 gram every 24 hours) may provide insufficient antimicrobial exposure in overweight and obese patients. As a result, use of ertapenem at doses greater than the labeled dose (high-dose) has increased.

The purpose of this study is to describe the utilization of high-dose ertapenem therapy at The University of Kansas Hospital. A secondary purpose is to assess both the incidence of reported adverse events and the treatment outcomes for patients receiving high-dose ertapenem therapy.

The endpoints will be assessed via a retrospective chart review of all patients receiving ertapenem therapy at doses greater than 1 gram every 24 hours from October 2011 to December 2013. Descriptive statistics will be utilized to identify factors influencing high-dose ertapenem therapy selection.

The results of this study will be used to provide guidance for the dosing of ertapenem in the obese patient population.

Learning Objective(s):
1.) Describe ertapenem pharmacokinetic changes in the obese population

Self Assessment Question(s):
1.) Limited pharmacokinetic and pharmacodynamic studies have suggested that for ertapenem, one could expect:
   A. Higher percent pharmacodynamic target attainment in normal body weight patients
   B. Reduced clearance in obese patients
   C. Increase in unbound ertapenem in normal body weight patients
   D. Both A & C

Answer: D
Methods to help refine antimicrobial stewardship are ongoing or constantly evolving and procalcitonin has emerged as a useful tool in minimizing antibiotic consumption. It serves as a specific biomarker for bacterial infections and studies have shown its usefulness in infectious processes such as lower respiratory tract infections and severe sepsis or septic shock. Its utility in antimicrobial stewardship is to help differentiate between various types of infections (e.g. bacterial vs. viral) as well as guide physicians in shortening the duration of total antibiotic consumption. With the increasing popularity of procalcitonin, our health system has witnessed an exponential rise in ordering procalcitonin levels without one of the aforementioned suspected presentations.

The objective of this study is to analyze procalcitonin usage in bacterial infections with lower levels of evidence in order to assess the effect on antimicrobial stewardship with respect to duration of antibiotic therapy. A secondary objective is to assess the financial impact of excess procalcitonin ordering on the health system. These objectives will be determined by obtaining patients with procalcitonin levels and comparing them to a cohort with matching ICD-9 codes that did not have procalcitonin drawn. Duration of antibiotic therapy will be determined and a multivariate analysis model will be used to compare the two groups.

The study results will be utilized to provide guidance in appropriate procalcitonin ordering, interpretation of lab results and application to antimicrobial stewardship.

Learning Objectives:
1. Discuss false positives that can affect procalcitonin testing
2. Determine appropriate utilization methods for procalcitonin

Self Assessment Questions:
1. Which patient(s) should have procalcitonin levels drawn?
   A. A renal transplant patient with pneumonia receiving anti-thymocyte globulin for rejection
   B. An immunocompetent female with a history of MRSA and active candidemia
   C. A 40 year old male with acute myeloid leukemia admitted to the ICU due to septic shock
   D. Both A and B

2. Which process best describes how procalcitonin lab testing should be utilized?
   a. Provide an order set with specific criteria for procalcitonin ordering
   b. Restrict procalcitonin orders to infectious disease physicians
   c. Create standardized algorithm to assess duration of antibiotic therapy
   d. Both A and C

Q1 Answer: C  Q2 Answer: D

Asthma self-management education has become increasingly important due to the rising costs of healthcare and the importance of minimizing patient hospitalizations. Asthma is one of the most common chronic childhood diseases in the United States, with 1 in every 11 children affected. The prevalence of asthma continues to increase, along with hospital admission rates for asthma, making this disease very costly. Self-management education is crucial for patients and families to achieve better control of their asthma symptoms. The benefits of asthma education have been well documented in the NHLBI asthma guidelines, and the guidelines suggest that asthma education should occur at each stage of care where there is interaction with a healthcare professional. Furthermore, children’s asthma care is a core measure for The Joint Commission.

The purpose of this study is to implement a pharmacist-run inpatient asthma class and secondarily analyze its impact on readmission rates. All pediatric patients less than 18 years old who are admitted to the University of Iowa Children’s Hospital with a new asthma diagnosis or for an asthma exacerbation will be asked to attend a pharmacist-managed educational session. Exclusion criteria include unwillingness or inability to attend the session. The primary outcome will be a measurement of patient satisfaction with the asthma education class. Secondary outcomes include quantitative improvement in patients' understanding of asthma and its triggers, management, and treatment. Pre- and post-surveys will be used to evaluate the overall effectiveness of the class.

Implementation of the inpatient asthma class is currently in progress.

Learning Objective:
1. Describe steps necessary to implement a pharmacist-managed inpatient educational class for patients and families.

Self Assessment Question:
1. Which of the following step(s) is/are important to consider when implementing a pharmacist-managed educational class:
   A. Communicate with key stakeholders
   B. Implement as quickly as possible
   C. Determine a way to measure the success of the program
   D. Both A & C

Q1 Answer: D
Therapeutic hypothermia is standard of care for neonatal hypoxic ischemic encephalopathy (HIE) as it helps limit neurologic sequelae. During therapeutic cooling, patients may require antibiotics. Gentamicin is commonly administered in neonates as it provides broad-spectrum coverage for organisms encountered in the first week of life. There are many possible reasons that patient with HIE may have decreased gentamicin clearance; among these is acute kidney injury.

Neonates with HIE receiving therapeutic hypothermia may have elevated gentamicin troughs during therapy. Conducting a review of these patients may enable identification of risk factors associated with elevated gentamicin troughs and allow for more targeted therapeutic drug monitoring.

This is an IRB approved, single center, retrospective cohort, chart review. Patients were identified from a 71-bed level IV Intensive Care Nursery to assess risk factors associated with elevated gentamicin trough levels during therapeutic hypothermia. Included patients received therapeutic hypothermia treatment and at least one dose of gentamicin in the first week of life. Patients were excluded if a minimum of one trough level was not obtained at least 60 minutes prior to the next dose of gentamicin or they were diagnosed with congenital heart or kidney disease prior to gentamicin administration. Risk factors included: occurrence of perinatal events, severity of HIE, administration of concomitant nephrotoxic drugs, inotropic support, decreased urine output and elevated serum creatinine during therapeutic hypothermia. Cohorts were designated as either elevated (>2 mcg/mL) or expected troughs (<2 mcg/mL).

The results of the study will be used to implement changes in the use of dexmedetomidine for sedation in pediatric cardiac surgery patients in order to improve sedation management.

Sedation in critically ill pediatric cardiac surgery patients is often challenging. Determining the appropriate agent that is not only efficacious but also safe without compromising the patient’s hemodynamic status is essential in this population. The objective of this study is to determine if the use of adjunctive dexmedetomidine to current sedation practices reduced the amount of intermittent sedation medications needed in pediatric cardiac surgery patients within the Pediatric Intensive Care Unit (PICU).

This single center retrospective review of patient medical records was approved by the Institutional Review Board. The health system’s electronic medical records system was queried to identify immediate post-operative pediatric cardiac surgery patients less than 18 years of age on standard of practice sedation medications with or without the addition of dexmedetomidine from January 1, 2007 through December 31, 2011. Patients receiving dexmedetomidine infusion for less than 24 hours, not requiring mechanical ventilation, or requiring extracorporeal membrane oxygenation (ECMO) and/or continuous renal replacement therapy (CRRT) were be excluded from this study. The following data will be collected: age (including gestational age), gender, weight, diagnosis, type of cardiac surgery, genetic abnormality, average daily doses of sedation and analgesic continuous infusions, average daily number of intermittent sedation bolus doses, days on mechanical ventilation support, and length of stay in PICU.

The results of the study will be used to implement changes in the use of dexmedetomidine for sedation in pediatric cardiac surgery patients in order to improve sedation management.

Learning Objectives:
1. Identify potential benefits of the use of dexmedetomidine for sedation in pediatric cardiac surgery patients.
2. Discuss the limitations of other sedation medications in pediatric cardiac surgery patients.

Self Assessment Questions:
1. Benefits of using dexmedetomidine for sedation include:
   A. Limited effects on respiratory depression
   B. Less opioid requirements
   C. Improvement in cardiac function
   D. Both A and B

2. Respiratory depression is most likely caused by which of the following:
   A. Dexmedetomidine
   B. Fentanyl
   C. Midazolam
   D. Both B and C

Q1 Answer: D  Q2 Answer: D
There is a lack of available data on appropriate vancomycin dosing in patients with morbid obesity, and obese patients with significant renal dysfunction are often excluded from studies. A previous pilot study conducted at our institution investigated vancomycin dosing practices in morbidly obese patients and identified inadequate dosing practices as well as potentially effective dosing strategies. The most effective dosing schedules in achieving a goal trough of 15-20 mcg/mL were vancomycin 12 mg/kg Q12H and 10 mg/kg Q8H, using actual body weight. We propose a second, retrospective, single-center study to assess the dose of vancomycin required to obtain therapeutic trough concentrations in patients with morbid obesity. The goal is to evaluate a more diverse patient population, validate previous findings, and lend insight into the most appropriate dosing regimen for patients with morbid obesity with or without comorbidities. We will conduct a multi-variable analysis to determine which patient-specific factors predict vancomycin toxicity or the attainment of therapeutic troughs in the morbidly obese.

Outcomes of interest include vancomycin dose in mg/kg and the interval frequency required to achieve a therapeutic serum trough level of 10-15 mg/L and 15-20 mg/L in patients with morbid obesity, stratified by renal function on admission; time to first therapeutic trough between 10-15 mg/L and 15-20 mg/L; and incidence of acute renal failure or acute on chronic renal insufficiency. The ultimate goal of this review will be to provide clinicians with guidance in terms of vancomycin dosing in this unique patient population.

Learning Objectives:
1. Identify unique pharmacokinetic properties associated with morbid obesity that may complicate dosing.
2. Report the results of a prior pilot retrospective assessment of vancomycin dosing in patients with morbid obesity.

Self Assessment Questions:
1. Which of the following is a unique pharmacokinetic property associated with morbid obesity that may complicate dosing?
   A. Increased volume of distribution
   B. Decrease in alpha-1-acid glycoprotein, causing alterations in free serum vancomycin concentrations
   C. Decrease in clearance
   D. Decrease in albumin, causing alterations in free serum vancomycin concentrations

2. Which of the following is an accurate conclusion from the prior pilot retrospective study of vancomycin dosing in patients with morbid obesity and normal renal function?
   A. Patients were oftentimes empirically over-dosed, resulting in a considerable incidence of nephrotoxicity
   B. 15 mg/kg Q24H was the most efficacious dosing regimen in achieving levels of 15-20 mcg/mL
   C. 12 mg/kg Q12H was an efficacious regimen in achieving levels of 15-20 mcg/mL
   D. 10 mg/kg Q12H was an efficacious regimen in achieving levels of 15-20 mcg/mL

Q1 Answer: A  Q2 Answer: C

RISK FACTORS AND OUTCOMES ASSOCIATED WITH VANCOMYCIN – INDUCED NEPHROTOXICITY.
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Current guidelines recommend vancomycin trough concentrations of 15-20mg/L for treatment of serious MRSA infections. More intense dosing needed to achieve the recommended serum concentrations has been associated with increased nephrotoxicity reports. No consensus exists on the association between vancomycin serum trough concentrations and acute kidney injury. Reports of the prevalence of vancomycin-induced nephrotoxicity (VIN) are variable. Risk factors/patient characteristics associated with VIN are not completely defined and outcomes of VIN have not been well described.

The purpose of this study was to determine the incidence of VIN among patients at our institution with vancomycin trough concentrations ≥15mg/L. We also sought to establish risk factors that increase the incidence of VIN and characterize the effects of VIN (progression to dialysis, time to recovery, impact on length of hospitalization).

Patient characteristics and laboratory values were extracted through review of paper charts and electronic medical records. Comparisons of variables between groups will be tested for significance using a two-tailed approach. Patient characteristics and potential risk factors for nephrotoxicity that have a statistically significant difference between patients with elevated vancomycin serum concentrations who had acute renal failure and those who did not in univariate analysis will be examined in a multivariate model.

Determining the incidence of VIN among patients hospitalized at our institution will better classify the risk of the adverse event. Identifying risk factors for and outcomes associated with VIN may help discern drug combinations and populations more likely to experience VIN.

Learning Objective:
1.) Discuss potential risk factors for vancomycin-induced nephrotoxicity (VIN).

Self Assessment Questions:
3.) Potential risk factors for the incidence of vancomycin-induced nephrotoxicity (VIN) include:
   A. Weight <60 kg
   B. Hypoperfusion states
   C. Concomitant nephrotoxic agents
   D. Both B and C

Q1 Answer: D
Inappropriate antimicrobial use has contributed significantly to the selection of multi-drug resistant bacteria. It has been reported that up to 50% of antimicrobial use is unnecessary or inappropriate. One important aspect of antimicrobial stewardship is to address the issue of antimicrobial resistance in healthcare facilities. Thus, understanding the relationship between antimicrobial utilization and bacterial susceptibility is pivotal in impacting changes in practice within the healthcare setting. The objective of this study is to describe the relationship between antimicrobial use and bacterial susceptibility patterns of several hospitals within our health system from January 2012 to December 2013.

The study was limited to four metropolitan hospitals within Saint Luke’s Health System. Antimicrobial purchase history for each hospital were collected. All doses of antimicrobials were converted into grams and expressed as defined daily doses (DDD). Defined daily doses were combined with patient census data for the same period to generate antimicrobial consumption rate, expressed as DDD/1000 patient-days. Susceptibility data were obtained from hospital-specific antibiograms over the same period. The trend in antimicrobial consumption (in DDD/1000 patient-days) and bacterial susceptibility will be compared and analyzed using simple linear regression.

The results of this study will be used to implement several key features into the Epic Electronic Health Record in attempt to improve rational antimicrobial use within Saint Luke’s Health System.

Learning Objectives:
1) Recognize the potential impact of inappropriate antimicrobial use on the emergence of bacterial resistance

2) Describe process changes manifested from antimicrobial use and resistance trends

Self-Assessment Questions:
1) In response to increasing bacterial resistance and lack of new antibiotic development, the IDSA published a policy statement urging research and development of new antibiotics called:
   A) 12 Steps to Prevent Antimicrobial Resistance.
   B) Get Smart: Know When Antibiotics Work.
   C) The 10 x ‘20 Initiative.
   D) Global Strategies to Reduce Antimicrobial Resistance.

2) Defined daily dose is:
   A) A statistical measure of antimicrobial consumption created by the Centers of Disease Control and Prevention.
   B) The assumed average maintenance dose per day of a drug used for its main indication in adults.
   C) The sum of single antimicrobial agents administered on a given day, regardless of doses administered.
   D) Both A & C

Q1 Answer: C
Q2 Answer: B


The risk of surgical site infections has become a focal point in hospital infection prevention. The objective of this study is to evaluate appropriate antibiotic selection for methicillin-resistant Staphylococcus aureus (MRSA) colonized patients receiving surgical prophylaxis before and after protocol implementation.

The institutional review board approved this single center, retrospective study of pediatric surgery patients that underwent orthopedic procedures between February 2010 and February 2012. A preoperative antibiotic protocol was established in February 2011 to ensure all patients who undergo surgery receive antibiotics based on a consistent, evidence-based approach. This study is designed to evaluate the percentage of orthopedic surgery patients with MRSA colonization who received appropriate antimicrobial prophylaxis as a result of the protocol initiation. Patients will be identified, through the electronic medical record system, as having a documented MRSA culture (true infection or surveillance colonization) prior to the procedure and the following data will be collected: antibiotic selection, dosing, timing of administration, and antibiotic redosing based on surgery duration. Patients that received clindamycin or vancomycin for an MRSA culture, without known sensitivities, are deemed as appropriate antibiotic selections. Patients that received clindamycin for clindamycin-resistant MRSA, or any patients that received cefazolin will be documented as inappropriate. Analysis of the data collection will be pooled to reflect orthopedic surgery patients that received antibiotic prophylaxis one year before versus one year after the protocol implementation.

The results of this study will be used to evaluate and improve the utilization of pharmacists in antimicrobial order entry.

Learning Objective:
1) Identify the key factors for determination of appropriate surgical antimicrobial prophylaxis

Self Assessment Question:
1) Appropriate antimicrobial prophylaxis coverage for a positive MRSA culture includes:
   A. Vancomycin for clindamycin-resistant organisms
   B. Redosing antibiotics for extended procedure times
   C. Cefazolin administered 60 minutes prior to surgery
   D. Both A & B

Q1 Answer: D
SAFETY COMPARISON OF OFF-LABEL ERTAPENEM DOSING VS STANDARD ONCE DAILY DOSING IN RENALLY IMPAIRED PATIENTS. Samuel Arends, Jennifer Miller, R. Spencer Schaefer, Kansas City VA Medical Center, 4801 Linwood Blvd, Kansas City, MO 64128. Samuel.Arends@va.gov

Rational: Ertapenem is a parenteral β-lactam antibiotic that is primarily eliminated by the kidneys. Pharmacokinetic studies of ertapenem show that both the half-life and area under the concentration-time curve are significantly increased after administration of 1 gram doses in patients with advanced renal insufficiency (ARI) and end-stage renal disease (ESRD) requiring hemodialysis. However, pharmacokinetic and pharmacodynamic studies are lacking with regard to the relationship between renal impairment and the frequency of adverse central nervous system (CNS) events. Several case reports exist of ertapenem-induced adverse CNS events, including seizure and encephalopathy, but the frequency of adverse CNS events following ertapenem administration in patients with renal insufficiency is not well defined.

Purpose: The objective of this study is to determine whether patients with ARI or ESRD receiving ertapenem at 1 gram doses are at a higher risk of experiencing adverse CNS events compared to those patients receiving the manufacturer recommended dose of 500mg.

Methods: A retrospective cohort study will be conducted using national Veterans Affairs data evaluating patients in both the inpatient and outpatient settings with ARI and ESRD receiving ertapenem. Patients receiving the manufacturer recommended dose of 500mg will serve as the control group, and the rate of adverse CNS events will be analyzed using chi-square test of proportions. A multivariate logistic regression will be used to determine the relationship between the primary outcome and any covariates.

Potential Outcomes: This study aims to provide more safety information regarding ertapenem dosing in ARI and ESRD to guide future prescribing practices.

Learning Objective:

Review the proper dosing for ertapenem in patients with renal impairment.

Self-Assessment Question:

For a patient with a creatinine clearance of 25 mL/min, what is the appropriate dose of ertapenem?

A. 500mg IV every 48 hours
B. 1000mg IV every 24 hours
C. 500mg IV every 24 hours
D. 1000mg IV every 48 hours

Q1 Answer: C

INCIDENCE AND SEVERITY OF ACUTE KIDNEY INJURY SEEN WITH MEROPENEM VERSUS PIPERACillin-TAZOBACTAM WITH CONCURRENT VANCOMYCIN THERAPY. Rachel Walker, Shelley Crooks, Stephanie Lager, Ashley Patterson, Katie Stow, Betsy White, Heartland Regional Medical Center, 5325 Faraon St., St. Joseph, MO 64506. rachel.walker@heartland-health.com

There is an increasing concern of acute kidney injury (AKI) resulting from drug toxicity in hospitalized patients. Commonly, patients receive antibiotics that contribute to AKI and quite often combinations of these medications concurrently. Acute kidney injury is defined as an abrupt decline in kidney function resulting from either functional or structural alteration to the organ. According to the drug-induced nephrotoxicity criteria, acute kidney injury is an increase in serum creatinine of ≥ 0.5 mg/dL from baseline, an increase in serum creatinine ≥ 50% from baseline, or a decrease in creatinine clearance of ≥ 50% from baseline. Currently there is limited information regarding the incidence of nephrotoxicity associated with concurrent use of the antibiotics; specifically vancomycin with either meropenem or piperacillin/tazobactam.

The purpose of this study was to evaluate the incidence and severity of acute kidney injury seen in patients receiving a combination of either vancomycin and piperacillin/tazobactam or vancomycin and meropenem using the drug-induced nephrotoxicity definition.

A retrospective review was done on patients placed on concurrent vancomycin with either piperacillin/tazobactam or meropenem. Patients were excluded from analysis if they had a baseline serum creatinine ≥ 2.0 mg/dL or had chronic kidney disease stage V or requiring hemodialysis. This analysis will allow for more clarity in comprehending the incidence and severity of acute kidney injury associated with specific combination antibiotic use. The aforementioned antibiotic regimens are commonly utilized in this healthcare system and the presentation of accurate data detailing nephrotoxic side effects may provide transparency for physicians concerning total patient care.

Learning Objectives:

1. Define acute kidney injury (AKI) as defined by the drug-induced nephrotoxicity criteria.

Self-Assessment Questions:

1. According to the drug-induced nephrotoxicity criteria, acute kidney injury (AKI) is:
   a. An increase in serum creatinine of ≥ 0.3 mg/dL from baseline, an increase in serum creatinine of ≥ 50% from baseline, or a reduction in urine output of <0.5 mL/kg/hour for > 6 hours
   b. An increase in serum creatinine of ≥ 0.5 mg/dL over baseline or any decrease in creatinine clearance
   c. An increase in serum creatinine of ≥ 0.5 mg/dL from baseline, an increase in serum creatinine ≥ 50% from baseline, or a decrease in creatinine clearance of ≥ 50% from baseline

Answer: C
Warfarin is a medication that poses potential risks for patients, including intracranial hemorrhage. Rapid reversal of warfarin can be a life-saving measure in these incidents. In addition to vitamin K administration, fresh frozen plasma (FFP) or three-factor prothrombin complex concentrates (3F-PCC) plus activated recombinant factor VII (rFVIIa) have previously been used for reversal of warfarin-related intracranial hemorrhage (WRICH). A four-factor prothrombin complex concentrate (4F-PCC) has been recently approved with the indication of urgent reversal of warfarin in adults with acute major bleeding.

The purpose of this study is to evaluate the efficacy, safety, and pharmacoeconomic impact of 4F-PCC compared to FFP in the management of WRICH. A secondary purpose is to determine the safety of 4F-PCC compared to the combination of 3F-PCC plus rFVIIa. A final purpose of the study is to assess the economic impact of utilizing a 4F-PCC.

These objectives will be assessed by reviewing a retrospective control group, FFP or 3F-PCC with rFVIIa, and a prospective 4F-PCC experimental group. Diagnosis codes upon discharge will be used to identify patients who experienced an intracranial hemorrhage at or during admission. Chart review will be completed to determine cause of bleed, reversal agents administered, patient demographic information, and other relevant study data. Appropriate statistical methods will be used to analyze data.

Study results will be used to ensure effective and safe reversal of WRICH patients within Saint Luke’s Health System.

Learning Objectives:
1.) Describe potential clinical benefits of using a 4F-PCC product compared to FFP or 3F-PCC with rFVIIa.
2.) Recognize the potential of a pharmacoeconomic benefit for utilizing the 4F-PCC.

Self Assessment Questions:
1.) Which of the following statements are correct?
   a. Use of a 4F-PCC achieves an INR < 1.5 more quickly than FFP.
   b. Use of a 4F-PCC achieves an INR < 1.5 slower than FFP.
   c. 4F-PCC is an inactivated product, theoretically decreasing risk for thromboembolic events.
   d. A and C

2.) What is the reason for a potential pharmacoeconomic benefit of utilizing the 4F-PCC?
   a. 4F-PCC holds an FDA-approved indication for warfarin-related major bleeding.
   b. Due to it’s FDA-approved indication, reimbursement may be better for 4F-PCC than 3F-PCC.
   c. 4F-PCC is significantly less expensive than 3F-PCC and rFVIIa.
   d. A and B

Answer: D

Pain management continues to remain a challenge in post-operative cardiac surgery patients. Opioids are routinely used for pain control; however, these medications are not without side effects. Intravenous acetaminophen provides an adjunctive option for pain control in this patient population. The aim of this study was to determine the efficacy of intravenous acetaminophen for pain control in post-operative cardiac surgery patients.

A retrospective review comparing post-operative cardiac surgery patients’ analgesic regimens was conducted. A pre-intervention group receiving standard analgesia without intravenous acetaminophen was compared to a post-intervention group who received intravenous acetaminophen as a part of their analgesic regimen. The primary endpoint compared amount of opioids used (in intravenous morphine equivalent dosages) 48 hours post-operatively. Secondary endpoints assessed included pain scores during the 48 hour post-operative period, length of intensive care unit (ICU) stay, overall length of hospital stay, time on ventilator, and post-operative nausea and vomiting.

Overall opiate use differed between the pre- and post-intervention groups (33.16 ± 22.91 mg vs. 19.19 ± 11.41 mg [p=<0.001]). The difference was significant in the first 24 hours (21.29 ± 16.11 mg vs. 10.38 ± 6.71 mg [p=<0.001]) but not significant in the 24-48 hour time period [p=0.229]. Secondary outcomes including overall length of stay, time on ventilator, and average number of doses of antiemetics administered 48 hours post-operatively were not significantly different between groups. ICU length of stay and pain scores will be assessed.

Intravenous acetaminophen is an effective adjunct agent for pain in the first 24 hours post-cardiac surgery.

Learning Objective: Describe the role of intravenous acetaminophen in post-operative cardiac surgery pain management.

Self Assessment: The use of intravenous acetaminophen after cardiac surgery:
   a. Significantly reduced opioid use in the first 24 hours post-op
   b. Significantly reduced opioid use 24-48 hours post-op
   c. Did not lead to differences in overall length of stay, time on ventilator, or antiemetic doses
   d. Both A and C

Answer: D
Acute major bleeding caused by or worsened by the use of oral anticoagulation medications, specifically warfarin, has no immediate reversal agents available. Patients hospitalized for acute major bleeds can be treated with fresh frozen plasma, 3-factor prothrombin complex concentrate, phytonadione, recombinant Factor VIIa, or any combination of these agents for reversal of bleeding.

The objective of this study was to evaluate the management of patients with acute major bleeding on concurrent oral anticoagulation within our community hospital setting.

A retrospective chart review was performed using an electronic medical record system to identify patients with acute major bleed diagnoses and concurrent oral anticoagulation therapy. Patients were excluded if pregnant, prison inmate, or if acute major bleeding did not occur. Data was collected on patient age, concurrent parenteral or oral antithrombotic agents, indication for anticoagulation, history of thromboembolic complication in the past 3 months, type of bleed, relevant laboratory data, anticoagulation reversal therapies used, and time to surgery if applicable. Evaluation of this data will help determine the potential role for 4-factor prothrombin complex concentrate in the management of patients with acute major bleeding induced by oral anticoagulants.

**Learning objectives:**

1. List the therapeutic options used to treat patients who present with acute major bleeding on concurrent warfarin therapy.

**Self Assessment Questions:**

1. What is four-factor prothrombin complex concentrate FDA approved for?
   a. Non-urgent reversal of acute major bleeding induced by warfarin therapy
   b. Urgent reversal of acute major bleeding induced by warfarin therapy
   c. Urgent reversal of acute major bleeding induced by dabigatran therapy
   d. Urgent reversal of minor bleeding induced by warfarin therapy

2. Available options for the treatment of acute major bleeding induced by warfarin therapy include phytonadione, fresh frozen plasma, 4-factor prothrombin complex concentrate, recombinant factor VIIa, 3-factor prothrombin complex concentrate.
   a. True
   b. False

**Q1 Answer:** B  **Q2 Answer:** A
To assess deep sedation’s impact on clinical outcomes for patients transferring from the ED to the ICU.

Research regarding sedation and analgesia management for mechanically ventilated patients is increasing, showing that deep sedation, particularly with benzodiazepines, may lead to worse outcomes. Findings from several studies have shown that benzodiazepines are associated with increases in mechanical ventilation times, delirium and prolonged lengths of stay. Most studies evaluating outcomes from sedation have included enrollment periods of 72 hours or longer post intubation, possibly missing the effect that early sedation has on patient outcomes. Since critically ill patients are admitted to the ICU from various locations, investigation of sedation practices in units outside the ICU may aid in educational and process changing measures that may impact ICU outcomes.

This is a retrospective case control study investigating patients transferred from the ED on sedation to the ICU. Mechanically ventilated patients who receive deep sedation in the ED will be placed in the case cohort and those without deep sedation prior to ICU arrival will be the control group.

The primary objective is to assess the impact of deep sedation upon ICU arrival from the ED on mechanical ventilation times compared to those individuals without deep sedation. Secondary objectives include ICU length of stay, rate and duration of delirium, and rate of ventilator associated pneumonia between the two cohorts.

The results of this study will be used to educate practitioners on the impact of deep sedation implemented in the emergency room on ICU outcomes.

Learning Objectives:
1) Describe the impact that deep sedation initiated in the emergency department has on ICU outcomes

Self-Assessment Questions:
1.) What is the recommended goal RASS score for most patients sedated in the ICU?
2.) What cognitive disorder does the CAM-ICU test detect in the presence of ICU patients?

Q1 answer: -2 to +1       Q2 answer: Delirium
The American Society of Health System Pharmacists requires pharmacy residents to achieve the outcome of providing "medication and practice related education". No standardization for residency programs to offer specific teaching opportunities to residents currently exists. As the profession of pharmacy becomes more complicated, pharmacists should be able to educate members of the healthcare team. The lack of standardization for teaching opportunities leads to inconsistent outcomes regarding the quality of each resident’s teaching skill set.

The purpose of this survey is to determine the current perceived value of providing teaching opportunities to PGY1 pharmacy practice residents in the perspective of residency program directors and to identify the features, depth, and breadth of the teaching experience afforded to PGY1 pharmacy residents.

The 20 question survey was distributed electronically to 868 ASHP accredited PGY-1 pharmacy residency program directors three times over a 6 week period. Based on an approximate 42% response rate, majority of directors value the importance of developing pharmacy clinicians and educators while a slight difference is seen in the value of completing a formal teaching certificate program. This may create difficulty when attempting to implement a standardized teaching experience among all programs.

A statistical analysis will be performed to identify correlations and differences based on program demographics, value-based responses, and resident activities.

**Learning Objectives:**

1.) Describe the depth and breadth of the teaching experiences afforded to PGY-1 pharmacy practice residents

**Self Assessment Questions:**

1.) All of the following are teaching activities in which over 50% of program survey respondents offer except:

   a. Facilitation of topic discussions
   b. Small group facilitation
   c. Didactic lectures
   d. Independent precepting

**Q1 Answer:** [D]

**Q2 Answer:** [C]

**Learning Objective:**

1) Describe the impact of a pharmacist-managed inpatient anticoagulation monitoring service on efficacy and safety outcomes related to anticoagulation therapy.

2) Identify factors which contribute to the complexity of warfarin therapy management.

**Self-Assessment Question:**

1) Due to the risks related to anticoagulants, Joint Commission has implemented a national patient safety goal to:

   A. Increase the frequency of anticoagulation therapy monitoring
   B. Reduce the likelihood of patient harm associated with the use of anticoagulation therapy
   C. Improve efficacy of existing anticoagulation therapy
   D. Limit the use of anticoagulation therapy in patients at low risk of thromboembolic events

2) Modifiable factors which contribute to the complexity of warfarin therapy management include:

   A. Age, drug interactions, and food interactions
   B. Drug interactions, food interactions, and genetics
   C. Patient compliance, drug interactions, and food interactions
   D. Drug interactions, food interactions, and lab variability

**Q1 Answer:** B

**Q2 Answer:** C
To analyze the impact of pharmacist-reviewed medication histories on the accuracy of the medication reconciliation process.

Incomplete and inaccurate medication histories have resulted in significant prescribing errors and patient harm in hospitalized patients. Pharmacists can play a key role in identifying discrepancies in the patient's medication history. The purpose of this study is to determine the extent and type of discrepancies identified by a pharmacist reviewing nursing-performed medication histories on adult inpatients at a single community hospital. The study will illustrate the interventions made by the pharmacist and the time spent on the medication reconciliation process.

This study did not require IRB approval. Data collection is in progress. A statistician determined 120 patients are needed to be adequately powered to show a difference of two interventions per patient. Patients included are 18 years of age and older under the care of one physician. Medication histories are gathered by a nurse within 24 hours of admission. The pharmacy resident reviews the information obtained to verify the accuracy, then documents any changes including discrepancies in dose, dosage form, route, frequency, medications no longer taking, and omissions. Discrepancies are communicated directly to the participating physician by phone. Additional data includes the source of medication history and resulting physician orders. To date, data has been collected on 120 patients.

Pharmacist-reviewed medication histories will likely show an improvement in accuracy compared to nurse-obtained histories, thereby improving the safety for the patient, and appropriateness of medications prescribed by physicians.

Learning Objective:
1. Describe the impact of pharmacist-reviewed medication histories on the medication reconciliation process.

Self-Assessment Question:
1. Pharmacists can have a positive impact on the medication reconciliation process by:
   A. Verifying medication information with a reliable source
   B. Communicating inconsistencies with physicians
   C. Relying on nursing staff to obtain medication histories
   D. Both A & B

Q1 Answer: D

EVALUATION OF A PHARMACIST-LED MULTIMODAL APPROACH TO PAIN MANAGEMENT IN AN INPATIENT COMMUNITY HOSPITAL. Brandon Thomas, Kyla Bidne, Benton Stamper and Cynthia Kuklenki, Shawnee Mission Medical Center, 9100 West 74th Street, Shawnee Mission, KS 66204. brandon.thomas@shawneemission.org

Pain in the acute care setting is common, with a majority of patients reporting pain during hospitalization. Uncontrolled pain has been directly correlated to a decrease in patient outcomes and satisfaction, and may result in decreased federal government reimbursement through the Hospital Care Quality Information from the Consumer Perspective Survey “HCAHPS.”

The purpose of this study is to evaluate whether intensive, unit specific nursing education and pharmacist-led pain consultations improve the quality of pain management in an acute care setting. Specific units throughout the hospital will be targeted for pain management education. Furthermore, the nursing staff will have the ability to consult a pharmacist for pain management recommendations and interventions. During the study period a pharmacist will address the pain management deficiencies of each unit by providing pharmacist-led pain management education. The nursing staff's knowledge of pain management and effectiveness of the nursing education will be assessed using a survey derived from the scientifically validated City of Hope “Knowledge and Attitudes Regarding Pain Survey.”

The primary outcome of this study will analyze the effectiveness of pharmacist-led nursing education through evaluating pre and post survey scores. Preliminary data implicates a deficiency in the nursing staff's knowledge of the pharmacologic principles of pain management which significantly improves with pharmacist-led education. The nursing staff's knowledge of pain management and effectiveness of the nursing education will be assessed using a survey derived from the scientifically validated City of Hope “Knowledge and Attitudes Regarding Pain Survey.”

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Learning Objectives:
1.) Describe opportunities in which a pharmacist can improve the quality of pain management in an acute care setting.
2.) Identify methods to evaluate the nursing staff’s knowledge in regards to pain management.

Self-Assessment Questions:
1.) Pharmacists can improve the quality of pain management through:
   a. Patient specific interventions with pain management regimen recommendations.
   b. Providing education about the pharmacologic principles of pain management.
   c. Changing all IV pain medications to PO once a patient is tolerating an oral diet.
   d. Both A and B

2.) Which survey has been scientifically validated to assess pain management knowledge in medical professionals?
   a. HCAHPS survey
   b. World Health Organization’s pain management assessment
   c. City of Hope “Knowledge and Attitudes Regarding Pain Survey”

Q1 Answer: [d]  Q2 Answer: [c]
HYPOGLYCEMIA IN INPATIENTS ADMITTED ON HOME ANTI-DIABETIC REGIMEN. Lindsey Nelson Douglass, Kristin Repp, Jennifer (Lamar) Guy, Mark Woods, Saint Luke’s Hospital of Kansas City, 4401 Wornall Road, Kansas City, MO 64111. Lnelson5@saint-lukes.org

Hypoglycemia is defined by the American Diabetes Association (ADA) as a blood glucose level ≤ 70 mg/dl and has well-established correlation to increased morbidity and mortality. Through better understanding of characteristics placing patients at risk for hypoglycemia, physicians may more accurately tailor regimens to prevent occurrence.

The purpose of this study is to identify factors contributing to hypoglycemia in diabetic patients admitted on their home anti-diabetic regimen. The primary endpoint is distinguishing the incidence of hypoglycemia. The secondary endpoint is identifying patient factors associated with hypoglycemic episodes.

The objectives will be assessed by retrospective chart review of all adult non-ICU diabetic patients admitted to a metropolitan campus within the health system between August 1, 2013 and October 25, 2013 on their home anti-diabetic regimen will be included. Patients will be excluded if admitted for hypoglycemia, if initial hypoglycemic episode occurred greater than five days into hospitalization, and patients with newly initiated or modified anti-diabetic regimens. Data analysis will be performed in conjunction with hospital statisticians.

Results from this study will be used to develop strategies to decrease hypoglycemia in patients with diabetes within the health system.

Learning Objectives:
1. Discuss recommendations by the ADA for admitted patients.
2. Indicate the impact of hypoglycemia on morbidity and mortality.

Self Assessment Questions:
1. Which is not part of the American Diabetes Association’s statement on inpatient care for diabetic patients?
   a. Prolonged therapy with sliding scale insulin only is ineffective
   b. Hypoglycemia protocols should target treatment of blood glucose <70 mg/dl
   c. Noncritically ill patients should have a target premeal blood glucose of <140 mg/dl
   d. Noninsulin agents are appropriate for hospitalized patients stabilized at home

2. What is the impact on morbidity and mortality for patients experiencing hypoglycemia?
   a. Increased hospital length of stay by 2 days for each episode of hypoglycemia
   b. Inpatient mortality is approximately 3% for a single hypoglycemic episode
   c. Approximately 2-4% of deaths in patients with diabetes have been attributed to hypoglycemia
   d. Cognitive impairment begins to appear at blood glucose levels ≤ 40 mg/dl

Q1 Answer: D  Q2 Answer: B

CHARACTERIZATION OF INGREDIENTS IN PRE-WORKOUT SUPPLEMENTS AND SYSTEMATIC EVALUATION OF THEIR SAFETY AND EFFECTIVENESS. Darren Hein, Philip Gregory, Bob Andersen, Amy Wilson, Zara Risoldi Cochrane. Center for Drug Information & Evidence-Based Practice, Creighton University, 2500 California Plaza, Omaha, NE 68178. darrenhein@creighton.edu

The use of pre-workout dietary supplements is extremely popular among professional and recreational athletes and bodybuilders. Most are marketed to increase energy, focus, and “muscle pump” during workouts. However, supplement manufacturers are not required to prove that their pre-workout supplements are effective. Additionally, reports of cardiac and liver toxicity with some pre-workout supplements have raised concerns about the safety of these products.

The purpose of this project is to first characterize the ingredients included in pre-workout supplements and then evaluate the safety and efficacy of those ingredients.

To identify pre-workout supplement ingredients, a systematic search using the search term “pre workout supplement” will be conducted on Google and Amazon.com to identify products marketed as pre-workout supplements. The ingredient names and respective doses contained in each selected pre-workout supplement will be extracted from the supplement label and tabulated in a database. A systematic, evidence-based analysis of the safety and efficacy of the top 20 ingredients will be conducted using supplement monographs from the Natural Medicines Comprehensive Database and Natural Standard along with relevant primary literature identified in PubMed and Google Scholar. By providing evidence-based information concerning the potential risks and benefits, if any, associated with pre-workout supplements, this project will allow consumers and healthcare professionals to make informed decisions regarding the use of these supplements.

Learning Objective:
Identify pre-workout supplement ingredients which are potentially unsafe and those which are potentially effective.

Assessment Question:
Which of the following statements is correct?
A. High-quality randomized controlled trials show that all pre-workout supplements are effective for increasing energy, focus, and strength during workouts.
B. A number of pre-workout supplements contain potentially dangerous ingredients.
C. The doses of individual ingredients in pre-workout supplement proprietary blends are always listed on the product label.
D. The safety and efficacy of pre-workout supplements must be reviewed by the FDA prior to marketing.

Answer: B
Transitions of care (TOC) has had a huge impact on providing quality care throughout a patient’s stay at The University of Kansas Hospital (UKH). From pharmacist-facilitated medication reconciliation to discharge counseling, patients have more direct interactions with a member of the pharmacy staff during their inpatient stay. Providing prescriptions at discharge is an important part of TOC and the patient’s continuity of care. UKH is a 676-bed hospital, and providing bedside delivery to inpatients will help them receive their prescriptions before discharge. The patients will be able to sign and pay for their medications at the bedside without worrying about making an extra stop at discharge.

The objective of this study is to determine whether bedside prescription delivery will increase patient satisfaction and script capture through UKH’s outpatient pharmacy. A pilot will be implemented on two specific internal medicine team floors, and patients will have the opportunity to opt into having their prescriptions delivered to the bedside at discharge. Once the patient is ready for discharge, the outpatient pharmacy will prepare and fill the medications and the delivery technician will bring the prescriptions to the bedside. Patients will be counseled through a tablet computer’s video capabilities, and the technician will accept the patient’s payment using a portable point-of-sale system.

The results of this pilot project will be used to determine the impact and benefits of bedside prescription delivery, and influence decisions about providing this service hospital-wide.

Learning Objectives:
1) Describe the impact of bedside prescription delivery in an academic medical center
2) Report the results and data of the one-month pilot project implemented by the UKH Outpatient Pharmacy team.

Self-Assessment Questions:
1) Bedside Prescription Delivery was implemented to:
   A. Ensure patients received their medications at discharge
   B. Complete the Transitions of Care process and add to the patient’s continuity of care
   C. Enhance workflow in the outpatient pharmacy
   D. Both A and B
2) Bedside Prescription Delivery showed a(n):
   A. Increase in script capture
   B. Decrease in patient satisfaction
   C. Decrease in overall compliance of medications
   D. Increase in wait time

Q1 Answer: D  Q2 Answer: A

The purpose of our study is to evaluate the implementation of a formal process for the dispensing of injectable prescriptions administered in ambulatory and mental health clinics. Our goal is to improve the current process by increasing efficiency and decreasing confusion for health care providers, nurses and patients.

In this quality improvement project, comparable ambulatory sites were researched to reveal what process is used in dispensing injections to be given in the clinic. From our research we developed a protocol for providers, nurses and veterinarians to follow which streamlined the current process. To measure the success of our implemented process, we first evaluated our current process by using a tally system over a four week period. This system recorded the number of times nursespicked the injection up at our pharmacy, how many patients brought their prescription to their appointment if instructed to do so and how many patients forgot to bring their prescription to their appointment. We then continued the tally system after implementing the proposed process for an additional four week period. A comparison of data from the tally forms was made to evaluate change.

Implementation of process resulted in a 93% reduction in the amount of times nurses went to pharmacy and the number of patients bringing their injection prescription to appointments increased by 51.6%. In both pre and post-implementation no patients forgot to bring their injection prescription to appointment. Implementation of process resulted in reaching our overall quality improvement goal of increasing efficiency of current process.

Learning Objectives:
1. Recall the goal met in improving the injection prescription processing.
2. Restate the results of the implementation of the injection prescription process protocol.

Self-Assessment Questions:
1. Goal(s) of improving the injection process includes:
   a. Increase patient interaction with pharmacy personnel
   b. Increase efficiency
   c. Decrease confusion for health care providers, nurses and patients
   d. B and C
2. The implementation of an injection prescription protocol resulted in the which of the following:
   a. Decrease in the number of times nurses picked injections up at the pharmacy
   b. Increase in the number of times patients forgot to bring their prescription to the appointment
   c. Decrease in the number of times patients received their injections
   d. There was no change in outcomes post-implementation of process

Q1 Answer: D  Q2 Answer: A
Learning Objectives:

1) Describe how benzodiazepines are being prescribed in the NWI veteran population.

2) Report the first line medications for PTSD according to the VA/DoD guidelines.

Self-Assessment Questions:

1) In the VA NWI Healthcare system, benzodiazepines are:
   A. More likely to be prescribed as needed
   B. More likely to be prescribed scheduled
   C. Equally likely to be prescribed as needed or scheduled
   D. None of the above

2) According to the VA/DoD guidelines, _____ should be used first- line in PTSD:
   A. Selective Serotonin Reuptake Inhibitors (SSRIs)
   B. Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs)
   C. Tricyclic Antidepressants (TCAs)
   D. All of the above

Q1 Answer: A  Q2 Answer: D

Establishment of a Clinical Pharmacist in a Veteran's Affairs Mental Health Clinic

Veterans Affairs has recently implemented a patient-centered medical model, called Patient Aligned Care Team (PACT). This concept was developed to provide patient-centered care, and increased accessibility and quality of care, as well as patient satisfaction. Clinical pharmacists were recently integrated into these teams. In the summer of 2013, Nebraska-Western Iowa (NWI) hired a clinical pharmacist specifically for the mental health care setting. Beginning November 2013, this pharmacist was placed in the mental health clinic (MHC), the Substance Abuse Residential Rehabilitation Treatment Program (SARRTP) and Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) program. This marked the first time clinical pharmacists were integrated into mental health clinics at NWI.

The purpose of this study is to survey clinical staff of the MHC, SARRTP and OIF/OEF programs to identify the perceived role of the clinical pharmacist. By determining the areas of need, the clinical pharmacist will be given a good background in determining where initial services should be focused. In executing the clinic, some of the initial problems will be identified, as well as methods of resolution, as the practice evolves.

The types of services that are performed by the mental health clinical pharmacist were documented between November 1, 2013 and February 28, 2014 using the coding and clinical reminder system reported in Computerized Patient Record System (CPRS) with each encounter.

The results of the study will be used to further develop the role of the clinical pharmacist in the mental health care setting and improve patient-centered care in these clinics.

Learning Objectives:

1.) Recall the main categories of possible encounters identified through a survey of mental health providers.

2.) Recognize the encounter type in which the clinical pharmacist was the most utilized throughout the study.

Self Assessment Questions:

1.) The main categories of possible encounters identified by the mental health providers include:
   A. Diagnosis of disease states, order entry and medication therapy management
   B. Initiating medication therapy, medication reconciliation, and diagnosis of disease states
   C. Medication therapy management, medication reconciliation, and medication safety monitoring
   D. Order entry, prescription filling and product verification

2.) The clinical pharmacist was most utilized for which type of encounter?
   A. Adverse Effect Management
   B. Medication Safety Monitoring
   C. Medication Reconciliation
   D. Substance Abuse/Dependency

Q1 Answer: C  Q2 Answer: C
Gout is a chronic disease, affecting approximately 4% of the population. Prophylactic and treatment options are highly efficacious. Allopurinol, in particular, has a long and well-established history with minimal side effects. Despite this, adherence to prescription medications for gout has been shown to be the lowest among seven common chronic diseases. Reasons for poor medication adherence include the absence of symptoms, forgetfulness, expense, presence of medication side effects and failure to see benefits from the medication.

The purpose of this study is to determine how specific patient factors, such as activation, self-efficacy and knowledge, are related to medication adherence. A brief questionnaire will be mailed to consecutive gout patients who filled an allopurinol prescription at the Veterans Affairs Nebraska-Western Iowa Health Care System between August 1, 2011 and July 31, 2012. This questionnaire will assess patients’ activation, self-efficacy and knowledge of their disease state. Medication adherence will be defined as the proportion of days covered (PDC) by allopurinol prescriptions. PDC will be calculated by taking the number of days’ supply of allopurinol a patient has on hand during the study period divided by 365. Consistent with other studies, optimal adherence will be defined as a PDC greater than 80%.

The results of this study will be used to determine if increased patient activation, self-efficacy and knowledge are associated with improved medication adherence. Future interventions, including pharmacist-led interventions, may target these important patient constructs in order to improve outcomes for gout patients.

**Learning Objective:**

1.) Identify the appropriate dose of allopurinol used for prophylactic therapy in gout patients.
2.) Explain why ongoing adherence to allopurinol therapy is important in gout patients.

**Self Assessment Questions:**

1.) What is the appropriate prophylactic dose of allopurinol in patients with gout?
   a. 300mg PO TID for 6 months.
   b. 600mg PO TID indefinitely.
   c. Increase allopurinol dose to target goal serum urate level; for 6 months.
   d. Increase allopurinol dose to target goal serum urate level; indefinite therapy.

2.) Why is ongoing adherence to allopurinol important in gout patients?
   a. Allopurinol must be taken daily to reduce inflammation.
   b. Allopurinol must be taken daily to reduce the production of uric acid.
   c. Allopurinol must be taken daily to maintain the excretion of uric acid from the body.
   d. Allopurinol must be taken daily to prevent rebound hyperuricemia.

**Q1 Answer:** D  **Q2 Answer:** B
Busulfan is an alkylation agent, commonly used in conditioning regimens for hematopoietic stem cell transplantation (HSCT). Busulfan is often combined with other agents such as cyclophosphamide or fludarabine to achieve myeloablation prior to the transplantation of allogeneic stem cells. Due to the narrow therapeutic index of busulfan, therapeutic drug monitoring is often used to obtain a concentration at steady state (Css) within a target of 800-1000 ng/ml. The purpose of this study was to retrospectively determine the percent of patients achieving targeted exposure to intravenous busulfan at a dose of 0.8 mg/kg for 16 doses.

Patients who received busulfan for their myeloablative conditioning regimen prior to allogeneic HSCT from 2008-2013 were retrospectively identified through the pharmacy billing database. The primary objective of this study is to determine the number of patients achieving target Css busulfan exposure following the first administration of busulfan as part of the myeloablative conditioning regimen for allogeneic HSCT. Secondary objectives included the number of patients with veno-occlusive disorder (VOD)/sinusoidal obstruction syndrome (SOS), neurotoxicity and graft failure, as well as the percent of patients achieving total dosing regimens within 10% of targeted busulfan dosing regimen using alternative dosing strategies.

Descriptive analysis was used to report demographic data, number of patients reaching target drug exposure using multiple dosing strategies and patient clinical outcomes.

The results of this study will be used to evaluate the initial busulfan dosing strategy at The Nebraska Medical Center.

Learning Objective:
1.) Describe the potential consequences of busulfan exposures outside the suggested therapeutic range.

Self-Assessment Question:
1.) Which is a potential consequence of busulfan exposure above 1500 mcg/min?
   a. Delayed engraftment
   b. Malignancy relapse
   c. Nephrotoxicity
   d. Neurotoxicity

Answer: d. Neurotoxicity

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The addition of rituximab to conventional chemotherapy has become standard of care for hematologic/oncology indications including non-Hodgkin’s lymphoma (NHL) and has drastically increased overall response rate, duration of the response and progression free survival. However, despite superior disease control and increased overall survival, the addition of rituximab to conventional chemotherapy has been associated with more severe immunosuppression, which can result in reactivation of serious viral infections including hepatitis B virus (HBV). For this reason, the CDC and AASLD recommend obtaining a hepatitis B panel prior to initiation of rituximab therapy.

The primary objective of this retrospective observational study is to report the current HBV testing rate prior to initiation of rituximab for Non-Hodgkin’s Lymphoma patients at The Nebraska Medical Center. Secondary endpoints will evaluate incidence of HBV positivity prior to rituximab therapy, HBV reactivation during and after therapy, and evaluate risk factors associated with HBV reactivation.

A retrospective chart review was performed on all NHL patients receiving initial rituximab therapy between January 1, 2012 and December 1, 2012. Patient and disease specific data was collected as well as hepatitis B panel information prior to initiation and for up to a year after initial rituximab therapy. Of the 56 NHL patients included, a hepatitis B panel was obtained in 48 patients (85.7%). Characterization of risk factors associated with HBV reactivation is ongoing and full results will be presented.

Learning Objectives:
1. Report the current compliance rate of obtaining a hepatitis B virus panel prior to initiation of rituximab therapy for patients with non-Hodgkin's lymphoma.

2. Identify hepatitis B virus positivity/reactivation rates and describe possible risk factors for HBV reactivation during/after rituximab therapy for non-Hodgkin's lymphoma.

Self-Assessment Questions:
1. The estimated compliance rate of obtaining a hepatitis B panel prior to the initiation of rituximab therapy was:
   A. 23%
   B. 46%
   C. 86%
   D. 100%

2. The Hepatitis B virus reactivation rate was:
   A. 2%
   B. 11%
   C. 17%
   D. 22%

Q1 answer: C  Q2 answer: A
An estimated 25% of 400 pipeline chemotherapy agents are now in oral formulations. As this number continues to increase, unique new challenges are presented to both patients and physicians as patients must take on a more active role in their own therapy. Due to the inherent dangers of these high risk medications, complexity of regimens, and consequences of poor adherence, extensive and ongoing patient education is needed to ensure the best clinical outcome. In 2013, the American Society of Clinical Oncology and the Oncology Nursing Society (ASCO/ONS) developed safety standards for the administration and management of oral chemotherapy and encouraged all cancer care providers to meet these goals. At this time, there is currently no institutional practice guideline in place at The University of Kansas Hospital (UKH) to ensure compliance with these standards.

The primary objective of this study is to assess UKH’s current practice for compliance against certain ASCO/ONS safety standards. The chosen standards are divided into the following three areas: documentation, monitoring, and education. A secondary objective is to develop a plan for the implementation of standards not met at UKH. A retrospective chart review will be conducted for patients newly started on an oral chemotherapy agent prescribed by a UKH physician in September of 2013 and charts will be reviewed for the initial office visit and one follow-up visit. Exclusion criteria include patients being seen at outside cancer clinics, those enrolled on a study, and anyone on an investigational oral chemotherapy agent or lenalidomide.

**Learning Objectives:**

1. Describe the impact of changing from intravenous to oral chemotherapy on patients and providers.

**Self-Assessment Questions:**

1. Which of the following do patients commonly believe about their oral chemotherapy agents?
   A. Oral chemotherapy agents are less tolerable than IV chemotherapy
   B. Oral chemotherapy agents can have complex regimens that impair patient adherence
   C. Oral chemotherapy agents can have different and worse side effects than their IV formulations
   D. Oral chemotherapy agents are less effective compared to IV chemotherapy

   **Q1 Answer:** [D]
EVALUATION OF PERCENT DOSING OF ACTUAL BODY WEIGHT AND OUTCOMES FOR PATIENTS RECEIVING 7+3 INDUCTION FOR ACUTE MYELOID LEUKEMIA. Whitney Bray, Cory Bivona, Michelle Rockey, Dave Henry, Dennis Grauer, Sunil Abhyankar, Omar Aljitawi, Siddhartha Ganguly, Joseph McGuirk, Anurag Singh, Tara Lin, The University of Kansas Hospital and Cancer Center, 2330 Shawnee Mission Parkway, Suite 201, Mailstop 5022, Westwood, KS 66205 wbray@kumc.edu

Rationale: To evaluate the outcomes of utilizing a percent of actual body weight (BW) for chemotherapy dosing of 7+3 (cytarabine and an anthracycline) induction for patients with acute myeloid leukemia (AML).

Background: Determining doses for chemotherapeutic medications and regimens requires evaluation of various patient factors, including co-morbidities, end-organ function, and concomitant medications. In obese adult cancer patients, physicians may empirically reduce doses to limit the toxicity potential by using an adjusted or ideal BW. There is potential to compromise outcomes when chemotherapy dosages are reduced, and the impact on clinical response in hematologic malignancies is unknown. The primary objective of this study is to evaluate the relationship between percent dosing of actual BW and complete remission (CR) rates in newly diagnosed AML patients.

Methods: Retrospective chart review of patients receiving induction chemotherapy at the University of Kansas Hospital for the treatment of AML between 4/1/2008 and 4/30/2013. Patients were excluded in the presence of an acute promyelocytic phenotype, empiric dose adjustments for reasons other than obesity, and patients weighing less than their ideal BW.

Results/Conclusions: Preemptive dose reductions for obesity did not influence CR rates for newly diagnosed AML patients undergoing 7+3 induction (p=0.83). Dose reductions were not associated with increase in death at 30 days or relapse rates at 6 months (p=0.94). When comparing body surface area (BSA) with CR rates, the mean BSA was higher in the group that did not obtain CR, but this value was not statistically significant (p=0.276).

Learning Objective:
1. Describe the outcomes of chemotherapy dosage reduction in newly diagnosed AML patients receiving 7+3 induction.

Self-Assessment Question:
1. Preemptive dose reductions for obesity in patients with newly diagnosed AML receiving 7+3 induction chemotherapy were associated with a(n):
   a. Overall decrease in complete remission rates
   b. Non-significant impact on complete remission rates
   c. Increase in death at 30 days
   d. Increase in relapse rates at 6 months

Q1 Answer: B

EVALUATION OF LOW MOLECULAR WEIGHT HEPARIN FOR THE PREVENTION OF VENOUS THROMBOEMBOLISM IN THROMBOCYTOPENIC BONE MARROW TRANSPLANT PATIENTS. Beth Brenner, Zahra Mahmoudjafari, Dennis Grauer, Michelle Rockey, Dave Henry, Omar Aljitawi, Sunil Abhyankar, Siddhartha Ganguly, Tara Lin, Anurag Singh, Joseph McGuirk, University of Kansas Hospital, 2330 Shawnee Mission Pkwy, Suite 201 Mailstop 5021, Westwood, KS 66205 ebrenner@kumc.edu

Venous thromboembolism (VTE) prophylaxis is recommended in hospitalized oncology patients by the American Society of Clinical Oncology (ASCO), however data is inadequate to recommend the use of routine thromboprophylaxis in patients undergoing hematopoietic stem cell transplantation (HSCT). Risk factors specific in HSCT patients include any malignancy, previous use of L-asparaginase or thalidomide, and indwelling catheters. There is very little data about the safety of the use of low molecular weight heparin (LMWH) in HSCT patients.

The objective was to compare the incidence of bleeding in hematopoietic stem cell transplant (HSCT) patients receiving LMWH for prophylaxis until platelet levels are less than 20,000 x 10^9/L to those patients who did not receive prophylaxis.

A retrospective, comparative, single center chart review of all patients who received an inpatient autologous or allogeneic stem cell transplant (bone marrow, peripheral blood, or umbilical cord blood source) at The University of Kansas Cancer Center between October 2009 to October 2013 was performed. Patients meeting inclusion criteria were assigned to one of four groups (autologous with and without prophylaxis and allogeneic with and without prophylaxis) until a maximum census of 100 patients in each group was reached. Data was collected during inpatient stay and one month after discharge.

In both the autologous and allogeneic transplant groups, there was not an increase in bleeding events with the use of LMWH for VTE prophylaxis. Based on the evidence provided in this study, it appears that the use of LMWH in patients with platelets between 20-50,000 x 10^9/L is safe.

Learning Objective:
1. Describe the risk factors versus benefits of the use of low molecular weight heparins for venous thromboembolism prophylaxis in hematopoietic stem cell transplant patients.

Self Assessment Question:
1. What is one of the risk factors for bleeding in HSCT patients?
   a. Graft versus Host Disease (GVHD)
   b. Hospitalization
   c. Presence of active malignancy
   d. Use of thalidomide

Answer: A
MENTAL HEALTH CLINICAL PHARMACY SERVICES (MHCPS) PILOT IN AN URBAN INPATIENT FACILITY.
Megan Moen, Tanya Barnhart, Mary Ullman, Regions, 640 Jackson Street, St Paul, MN 55101. Megan.L.Moen@healthpartners.com

Psychiatric patients are more likely than the general population to have high-cost comorbid physical health problems. Pharmacist treatment recommendations can improve outcomes, prescribing practices, patient satisfaction and resource use. Regions Hospital is the largest mental health services provider in the east metro Twin Cities with 100 inpatient beds, yet its current model for psychiatric inpatient services has the highest patient to pharmacist ratio of any clinical pharmacist position and little to no direct interaction between pharmacist and patient, provider, or nurse.

The purpose of the MHCPS pilot was to describe the potential for impact of full-time clinical pharmacist services on interventions, cost-savings, and coordination of patient care in the acute care mental health setting; and identify areas for patient care improvement within our institution.

The MHCPS pilot was conducted over a 24-day period in fall 2013. Pharmacists were present on the mental health unit for eight hours daily and interventions were tracked electronically. Interventions were reviewed retrospectively and cost-analysis on specific interventions was performed using a clinical surveillance software system. An anonymous electronic survey was distributed to all mental health staff at pilot completion to evaluate staff perceptions on pharmacist delivered services.

Preliminary data from the pilot contributed the decision to hire a dedicated mental health pharmacist at Regions Hospital. Data analysis is in process and full results will be presented at Midwest Pharmacy Residents Conference in May 2014.

Learning Objectives:
1.) Describe the potential for impact of clinical pharmacy services

Self Assessment Questions:
1.) Mental health clinical pharmacists at Regions Hospital have the opportunity to positively impact:
   a.) Polypharmacy
   b.) Costs
   c.) Transitions of Care
   d.) Interprofessional relations
   e.) All of the above

Q1 Answer: (e)

IMPLEMENTATION AND EVALUATION OF A DEPRESSION SCREENING PROTOCOL IN HEART FAILURE PATIENTS.
Tonya Gross, Shana Brunsvold, and Zach Law. Mercy Medical Center-North Iowa, 1000 4th St SW, Mason City, IA 50401. grosslk@mercyhealth.com

Depression is a common comorbidity among cardiac rehabilitation patients; in particular it is slightly more common in heart failure patients than other cardiac conditions. Depression can negatively impact heart health along with compliance to medications. The primary objective of this study is to implement and evaluate a depression screening protocol in heart failure patients admitted to the acute cardiac unit. Secondary objectives are to compare the degrees of depression severity, examine the variances in patient demographics, and evaluate the psychiatrists' interventions.

The Patient Health Questionnaire (PHQ-9), a self-reporting scale for depression, will be given to heart failure patients, newly diagnosed or exacerbation, admitted to the cardiology floor. PHQ-9 scores of 1-4 indicate minimal depression and scores 5-9 indicate mild depression. Scores > 10 indicate moderate, moderately severe, or severe depression, and will receive a psychiatry consult. At least 50 PHQ-9 questionnaires will be collected from patients over a three month time period. Questionnaire scores will be analyzed retrospectively to determine how many heart failure patients are impacted by the implementation of a depression screening protocol. Impacted patients will be considered those that received psychiatry consult. Furthermore, the psychiatry interventions will be analyzed to evaluate how many patients were started on an antidepressant. The results will determine if continued screening for depression is a reasonable and beneficial addition to the heart failure patient population at Mercy Medical Center-North Iowa.

Learning Objective:
1) Identify the relationship between depression and heart failure.

Self-Assessment Question:
1) Which of the following is correct in terms of the relationship of depression to heart failure?
   A. Depression can affect medication compliance
   B. Depression can have an effect on the pathophysiology of heart failure
   C. Depression can be more common in heart failure than other cardiac conditions
   D. All of the above

Q1 Answer: D
Purpose: The VA Central Iowa policy on antipsychotic polypharmacy requires the provider to document appropriate justification for prescribing two or more antipsychotic medications. Justifications are based upon Joint Commission National Quality Core Measures and include at least three failed antipsychotic monotherapy trials, a recommended plan to taper to monotherapy, or a cross-taper in progress. The VA Central Iowa policy also states clozapine should be offered as an option for any Veteran diagnosed with schizophrenia or schizo-affective disorder who has experienced two antipsychotic medication failures. The objective of this project is to perform a chart review to determine if this policy is being followed and to offer a pharmacy consult service to help assess antipsychotic polypharmacy.

Methods: Prior to commencement, this review was submitted to the privacy officer, chief of pharmacy and chief of staff for approval. Provider documentation will be reviewed for appropriate justification for the use of antipsychotic polypharmacy and whether clozapine has been considered as an option. If no documentation is found justifying the antipsychotic polypharmacy, the provider will be notified and offered a mental health clinical pharmacy consult for further review and evaluation. Records of consulted Veterans will be reviewed by one mental health clinical pharmacist and one pharmacy resident who will offer assessment and any clinically relevant recommendations to address antipsychotic polypharmacy. The presence or absence of appropriate documentation will be the primary outcome of this review. Secondary outcomes may include cost avoidance and acceptance of clinical pharmacist recommendations.

**Learning objective:**
1. Identify appropriate justifications for antipsychotic polypharmacy use.

**Self-Assessment Question:**
1. Which of the following justifications of antipsychotic polypharmacy is considered appropriate per Joint Commission National Quality Core Measures?
   - A. A cross taper to antipsychotic monotherapy is in progress
   - B. The patient was admitted to an acute psychiatric ward where two antipsychotics were used to stabilize psychosis
   - C. Quetiapine is being used for sleep and aripiprazole is being used for antidepressant augmentation

**Answer:** A

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**TRENDS IN PREVALENCE AND SCREENING OF VITAMIN B12 AND FOLATE DEFICIENCIES IN VETERANS WITH COGNITIVE IMPAIRMENT.** Kari Angwin, Tami Argo, Jason Egge, Bruce Alexander. Iowa City Veteran Affairs Health Care System. 601 Highway 6 West, Iowa City, IA 52246. Kari.angwin@va.gov

The risk for development of vitamin B12 deficiency, folate deficiency, and cognitive impairment all independently increase with age, with those at highest risk aged 65 years or older. Studies suggest deficiency of vitamin B12 and folate may play a role in pathogenesis of cognitive impairment in the elderly. Guidelines recommend screening for deficiencies in populations with dementia and cognitive impairment. A small subset of dementias are reversible with vitamin B12 therapy and treatment is inexpensive and safe. Although only a minority of all dementia cases are fully reversible, many dementias from other etiologies are exacerbated with concomitant low vitamin B12 levels.

The objective of this study is to determine if annual vitamin B12 and folate laboratory screening rates associated with an initial diagnosis of cognitive impairment has changed over time. Secondary objectives are to establish whether there are age-dependent or diagnosis-dependent differences in screening rates.

This 10-year retrospective study will involve National Veterans Affairs (VA) patients aged ≥ 40 years old with newly diagnosed cognitive impairment. Descriptive statistics will be generated from demographic data. Annual prevalence rates will be evaluated to assess trends, with subgroup analyses performed to evaluate differences by age and degree of cognitive impairment.

Results of this study will establish the level at which health care providers are screening for these deficiencies and improve decision making associated with cognitive impairment within the Veterans Affairs’ Health Care System.

**Learning Objective:**
1. Describe the associations between vitamin B12 and folate deficiencies and cognition

**Self-Assessment Question:**
1. What effect do vitamin B12 and folate deficiencies have on cognition?
   - a. Vitamin B12 deficiency improves cognition while folate deficiency causes cognitive decline
   - b. Both vitamin B12 and folate deficiencies are associated with decreased cognitive function
   - c. Vitamin B12 and folate deficiencies are the cause of Alzheimer’s Disease
   - d. Neither vitamin B12 nor folate deficiencies are associated with effects on cognition
   - e. 

**Self-Assessment Answer**
1. B
Studies have suggested a relationship between topiramate, a carboxylic anhydrase inhibitor, and decreased serum bicarbonate, which can result in metabolic acidosis and related adverse effects. The objective of this study is to assess changes in serum bicarbonate within the first year of topiramate use in an outpatient veteran population.

This was a single center retrospective cohort study conducted at the Iowa City Veterans Affairs Health Care System. Inclusion required a minimum of one outpatient prescription for topiramate between October 1, 1999 and August 31, 2012, and at least one serum bicarbonate level within 12 months prior to topiramate initiation. Subjects were excluded if there was evidence of poor topiramate compliance, concurrent sodium bicarbonate use or concurrent use of oral carboxylic anhydrase inhibitors during the study period. Serum bicarbonate values obtained during inpatient hospitalizations were also excluded. A total of 576 participants were included for analysis.

A paired t-test was used to evaluate change in serum bicarbonate. Decreases in serum bicarbonate of ≥5 mEq/L, serum bicarbonate values <20 mEq/L, topiramate doses, diagnoses, rational for topiramate discontinuation if applicable, and time to lowest serum bicarbonate value were also evaluated. Results of this study will assist in determining appropriateness of routine monitoring of serum bicarbonate with topiramate use.

Learning Objectives:
1.) Identify the proposed mechanism of action by which topiramate lowers serum bicarbonate.
2.) Describe common adverse effects associated with topiramate use.

Self-Assessment Questions:
1.) Topiramate lowers serum bicarbonate by which of the following mechanisms of action?
   a) Blockage of voltage-dependent sodium channels
   b) Antagonism of AMPA/kainate subtype of the glutamate receptor
   c) Carbonic anhydrase inhibition
   d) Augmentation of GABA activity at some subtypes of GABA-A receptors
2.) Which of the following is a common adverse effect of topiramate?
   a) Hyperactivity
   b) Weight loss
   c) Increased appetite
   d) QTc prolongation

Q1 Answer: C Q2 Answer: B Answer: N/A
This project assessed patient satisfaction with a community pharmacy based medication synchronization program. A grocery store pharmacy chain in the Kansas City metropolitan area currently offers a medication synchronization program to patients at one of their 20 locations. The program, Time My Meds (TMM), launched July 2013, allows medications to be synced every 30 or 90 days. A survey was administered to patients after three months of program participation, to determine patient satisfaction with the program. The survey collected demographic information along with satisfaction utilizing questions modified from the Diabetes Disease State Management Questionnaire using a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree). Program participants included patients or caregivers 18 years of age or older, picking up at least three months of synchronized fills. Those with refills only occurring every 90 days were excluded from the study. Eligibility was determined using refill history extracted from pharmacy and TMM software. Printed surveys were distributed to participants when they picked up medications at the pharmacy. Data collection took place from 10/2013 to 2/2014. Fifty-seven individuals met inclusion criteria, but nine surveys were either not distributed or not returned. Data collected from 48 surveys were analyzed. Descriptive statistics were used to evaluate patient demographics. Program satisfaction was evaluated using chi-square with an a-priori alpha of 0.05.

Data analysis is in progress. Results are expected to provide insight into satisfaction with a medication synchronization program. If participants are satisfied with the program it would justify its expansion and may improve medication adherence.

Learning Objectives:
1.) Describe what has previously been done to improve medication adherence in a community pharmacy setting.

Self-Assessment Questions:
1.) Which of the following have been used by community pharmacies to improve medication adherence?
   A. Automatically refilling medications for patients on a monthly basis
   B. Denying refill requests if patients have not been their doctor for more than 1 year
   C. Referring patients that need refills on chronic medications to the nearest Emergency Room
   D. Encouraging patients to request refills the day that they run out of their medication

Q1 Answer: A

Community pharmacists can play an integral role in preventing adverse events from medications by providing Medication Therapy Management (MTM) services. Open communication between pharmacists and physicians is an essential element to improve patient outcomes. The purpose of this study is to identify physicians’ preferences in regards to pharmacist-provided MTM communication in the community pharmacy setting; to identify physicians’ perceived barriers to communicating with a pharmacist regarding MTM; and to determine if Missouri physicians feel MTM is beneficial for their patients.

A cross-sectional, prospective study is being conducted using mail-in surveys. The survey contains items that address physicians’ experience with MTM, physicians’ preferences regarding MTM communication, physicians’ perceived barriers to communicating with pharmacists regarding MTM, and whether or not physicians feel that MTM is beneficial for their patients. The survey will also collect the following demographic data: gender, age, years in practice, and practice specialty. Surveys were mailed to 2,022 general and family practice physicians registered with MO HealthNet (Missouri's Medicaid Program). Descriptive statistics will be used to analyze the demographic information. Nominal data will be evaluated utilizing chi-square analysis. Data points will be analyzed using the SPSS statistical software program.

Based on the feedback provided, the currently used methods of communication will be evaluated to determine where changes need to be made and the information provided regarding the perceived barriers to successful pharmacist-physician communication will be used to identify interventions/changes to address these barriers.

Learning Objective(s):
1.) Describe the five core elements of an MTM service model established by the American Pharmacists Association and the National Association of Chain Drug Stores Foundation.

Self Assessment Question(s):
1.) Which of the following core elements of an MTM service model, established by the American Pharmacists Association and the National Association of Chain Drug Stores Foundation, requires pharmacists to communicate with physicians regarding recommendations and suggestions to address medication-related problems?
   A.) Medication therapy review
   B.) Personal medication record (PMR)
   C.) Medication-related action plan (MAP)
   D.) Intervention and/or referral
   E.) Documentation and follow-up

Q1 Answer: D
IDENTIFICATION OF MEDICATION DISCREPANCIES BY COMMUNITY PHARMACISTS DURING A COMPREHENSIVE MEDICATION REVIEW IN PATIENTS 1 WEEK POST HOSPITALIZATION. Roxane Took, Peggy Kuehl, and Yifei Liu. Price Chopper Pharmacy, 6475 N Prospect Ave, Gladstone, MO 64118. roxane.took@ballsfoods.com

Balls Food Stores is a self-insured regional grocery store chain with 2626 covered lives. We provide many employee wellness services including disease state management for diabetes, hypertension and hyperlipidemia; smoking cessation classes, health screenings, and immunizations. The most recent service added is for pharmacists to provide a comprehensive medication review (CMR) to employees within one week of being discharged from a hospital or intermediate level of care.

The purpose of this study is to determine the number of medication discrepancies and severity of drug-related problems resolved when performing a CMR for these employees.

Pharmacists began providing CMRs to discharged employees in November 2013. This study is a retrospective review of the CMR records to assess the data collected for employees seen from November 22, 2013, to March 31, 2014. Discrepancies will be identified among employee's medication regimens before admission, after discharge, and what they are actually taking post discharge. Medication-related problems will be placed into the following categories: (1) additional drug therapy, (2) unnecessary drug therapy, (3) wrong drug, (4) dosage too low, (5) dosage too high, (6) adverse drug reaction/drug interaction, and (7) adherence. Interventions will be categorized using the severity scale employed by OutcomesMTM™. This project will be submitted for exempt research. Chi-square and Wilcoxon rank-sum tests will be used to compare data.

By assessing the types of discrepancies found, and assigning value to the severity of medication-related problems resolved, we aim to determine if this service results in positive outcomes for our employees who are hospitalized.

Learning Objective:
1.) Identify types of medication-related problems that occur after discharge.

Self-Assessment Question:
1.) Identify a type of medication-related problem that occurs after discharge.
A. Mislabeled medication
B. Medication given to wrong patient
C. Unnecessary drug therapy
D. Incorrect dosage form dispensed

Q1 Answer: C

COST-ANALYSIS AND EVALUATION OF PATIENT AND PROVIDER SATISFACTION OF PHARMACIST-DELIVERED TRAVEL HEALTH SERVICES IN A COMMUNITY PHARMACY. Megan Ford, Erika Ernst, Stevie Veach, and Thane Kading, University of Iowa College of Pharmacy, 115 S. Grand Ave, Iowa City, IA 52242 megan-ford@uiowa.edu

To determine if pharmacist-delivered travel health services, excluding immunizations, would be cost-effective if reimbursed using a two-level, triple-tier payment system. To evaluate patient and provider satisfaction with pharmacist-delivered travel health services.

This is a prospective, observational study in a Midwest grocery store chain pharmacy. The pharmacist will document time spent gathering recommendations from the Centers for Disease Control and Prevention (CDC) and counseling on general travel information for patients who present for travel health services from October 2013-February 2014. The patient will be charged a fee similar to a physician office visit insurance copay for the consultation. For study purposes, a two-level, triple-tier system will be used for data collection. Level 1 will correspond to the number of countries visited (Tier 1 is 1-2 countries, Tier 2 is 3-4 countries, and Tier 3 is ≥ 5 countries). Level 2 will correspond to pharmacist time (Tier 1 is ≤ 30 minutes, Tier 2 is 31-60 minutes, and Tier 3 is > 60 minutes). Each visit will be assigned a fee based on the highest categorized Tier, whether it is Level 1 or Level 2. The dollar value assigned per tier will be $150 for Tier 1, $175 for Tier 2, and $200 for Tier 3. A cost-analysis will be done with data collected to determine whether the service is cost-effective.

Surveys using a 5-point Likert scale will be sent to past and current travel health patients and providers who have been contacted for prescriptions related to travel. The questions will assess overall satisfaction and perceived value of the service, areas for quality improvement, and confidence in pharmacist's recommendations (for providers only). Descriptive statistics will report results.

Research in progress.

Learning Objective:
1. Recognize the significance of pharmacist’s ability to bill for clinical services.

Self-Assessment Question:
1. As a result of pharmacist’s ability to bill for clinical services, ________.
   A. The services offered would be more cost-effective for the pharmacy
   B. The services offered would be less cost-effective for the pharmacy
   C. There will be no difference seen in cost

Q1 Answer: A
EVALUATING THE EFFECT OF THE APPOINTMENT BASED MODEL ON INCREASING MEDICATION THERAPY MANAGEMENT INTERVENTIONS AND IMMUNIZATION RATES IN A COMMUNITY PHARMACY. Alex Martin, Alan Shepley, Amy Jackson, Yuexin Tang, Stevie Veach, Shepley Pharmacy, 113 E 1st St Mt Vernon, IA 52314 alexander-d-martin@uiowa.edu

Healthy People 2020: Impact of Screening and Immunization Services on Diabetes Patients in the Community Pharmacy Setting. Janis Rood, Matthew Osterhaus, Angi Spannagel, Linnea Polgreen, Karen Farris, Stevie Veach. Osterhaus Pharmacy, 918 W. Platt, Ste. 2, Maquoketa, IA 52060 janis-rood@uiowa.edu

Pharmacists face many barriers to providing medication therapy management (MTM) and immunization services in a community pharmacy. The appointment based model (ABM) is a program that allows medication synchronization to a monthly appointment date and may decrease barriers to providing those clinical services. The objectives of this study are to compare pre and post enrollment MTM interventions identified by pharmacists and describe indicated zoster and pneumonia immunizations administered in patients enrolled in a pharmacy’s ABM medication synchronization program.

Patients with more than five medications will be targeted for enrollment into the program by pharmacy staff using promotional material. To synchronize medications to one monthly appointment, patients will agree to monthly reminder phone calls, receipt of preliminary partial fills, and payment of corresponding copayments. Enrolled patients will be contacted by phone one week before the monthly appointment, using a standardized script to inquire about needed refills and scheduling indicated vaccinations. All requested medications will then be filled prior to the appointment and patients’ medication profiles will be reviewed for potential MTM interventions prior to the appointment. At the appointment pharmacists will make and document MTM interventions as well as any required follow-up. An OutcomesMTM™ claim will be submitted for OutcomesMTM™ patients. MTM interventions, OutcomesMTM™ claims, and indicated vaccines received by enrolled patients will be reported using descriptive statistics.

The results of this study will be used to expand and implement the ABM synchronization program as a viable model for integrating MTM and immunization services into a community pharmacy workflow.

Learning Objective: Be able to describe the role that the ABM synchronization program plays in identification of MTM interventions.

Self-Assessment Question: Which of the following best describes the role that the ABM synchronization program plays in identification of MTM interventions?
A. The ABM synchronization program has no effect on identification of MTM interventions
B. The ABM synchronization program only increases the identification of drug interaction interventions.
C. The ABM synchronization program increases the identification of MTM interventions.

Answer to Self-Assessment Question: C

A major initiative of Healthy People 2020 is increasing immunization rates, especially for high-risk patients, such as those with diabetes. Community pharmacists are in the perfect position to advance this public health service.

To demonstrate the ability of community pharmacists, using ACIP immunization guidelines, to: 1. identify diabetes patients who are not up-to-date; 2. bring up-to-date diabetes patients through a) pharmacy services or b) referral to physician services; and, 3. identify barriers when pharmacist intervention is unsuccessful.

Patients 18 years or older who filled any FDA-labeled diabetes medications were targeted for enrollment. A screening tool based on ACIP recommendations for diabetes was developed, and the Iowa Immunization Registry Information System (IRIS), with supplementary data from physician offices or patient report, was used. All patients enrolled were screened and targeted for any necessary vaccinations. Enrolled patients were categorized as: 1. up-to-date; 2. not up-to-date, and a) brought up-to-date through pharmacy services, b) brought up-to-date through pharmacist referral to physician services, or c) not brought up-to-date. Reasons for referral to physician services or declination were documented.

Reports identified 242 patients with diabetes, 166 of whom were enrolled for screening. Only 3 patients were up-to-date without intervention. Currently, 35 patients have been brought up-to-date via pharmacist intervention, and 1 via referral to physician care. There were 11 patients who declined, the majority of whom could not afford the cost of vaccinations or did not feel vulnerable to vaccine-preventable diseases. Tdap, pneumococcal and zoster vaccines were the most common outstanding immunizations, respectively.

Learning Objectives:
1. Recognize which vaccinations recommended by ACIP guidelines for diabetes patients aged 65 years and older are covered by Medicare Part B and Part D.
2. Describe barriers to implementing immunizations services in the community pharmacy setting.

Self-Assessment Questions:
1. For diabetes patients aged 65 years and older _____ and _____ are covered by Medicare Part B, while _____ and _____ are covered by Medicare Part D.
   a. Tdap and zoster; influenza and pneumococcal
   b. influenza and pneumococcal; Tdap and zoster
   c. influenza and zoster; Tdap and pneumococcal
   d. pneumococcal and zoster; Tdap and influenza

2. Which of the following describe barriers to implementing immunizations in the community pharmacy setting?
   a. cost of vaccines
   b. patient beliefs
   c. targeting patients
   d. Both A and B

Q1 Answer: B   Q2 Answer: D
STANDARDIZATION OF CARE IN PHARMACIST MANAGEMENT OF QTc-PROLONGING DRUG INTERACTION ALERTS AND RISK ASSESSMENT OF QTc PROL elongation in Critical Care Patients. Robin Wingate, Thaddauss Hellwig, and Kim Messerschmidt; Sanford USD Medical Center, 1305 W 18th St, Sioux Falls, SD 57117 robin.wingate@sanfordhealth.org

To evaluate pharmacist satisfaction with current practices regarding the management of QTc-prolonging drug interaction alerts (QPDIA) prior to and following the implementation of a QTc Drug Alert Decision Algorithm. Also, to determine the overall incidence of QTc prolongation in the critical care population at Sanford USD Medical Center and identify the subset of patients with QTc prolongation that would not generate a QPDIA based on the medications they received during their critical care admission.

Pre-algorithm pharmacist surveys were distributed to gauge pharmacist satisfaction with how QPDIA were processed at baseline and to quantify interventions performed. Post-algorithm surveys were distributed to measure pharmacist satisfaction with the algorithm and to characterize interventions. A validated, risk stratification scoring tool was used to categorize patients’ risk level for developing QTc prolongation, and to assess the incidence of QTc prolongation within each risk category. Individual data points collected on the patients during their intensive care stay included age, sex, serum potassium, daily QTc, generation of drug interaction alerts, loop diuretics usage, QTc-prolonging medications, and diagnoses of acute myocardial infarction, septic shock, or heart failure. Data collected on these patients facilitated the identification of patients with QTc prolongation that did not have QPDIA flagged during order verification.

Preliminary review of the survey data suggests there are many challenges to implementing a new, pharmacist-driven protocol. Early interpretation of the risk score data support the view that QPDIA are not a reliable screening tool for identifying critically ill patients at risk for QTc prolongation.

Learning Objectives:
1) Explain the feasibility and utility of standardizing a process for assessing QTc prolongation risk
2) Evaluate the limitations of relying upon QTc-prolonging drug interaction alerts to screen for patients at risk of QTc prolongation

Self-Assessment Questions:
1) Which of the following are true about drug-induced QTc prolongation?
   A. QTc prolongation is highly dependent on the presence of risk factors
   B. There is ample guidance available on how best to monitor patients receiving agents with electrophysiologic effects
   C. Prolonged QTc in critically ill hospitalized patients is not associated with increased length of stay and in-hospital mortality
   D. Both (A) and (B)

2) This performance improvement project showed that:
   A. QTc prolonging drug interaction alerts are a reliable tool for screening patients at risk for QTc prolongation
   B. Readily obtainable clinical data points can be used to quantify a patient’s risk for QTc prolongation
   C. Implementation of a new, pharmacist-driven protocol can be accomplished easily without the need for adaptations to the protocol and follow-up education
   D. Pharmacists are not generally receptive to the idea of standardizing processes

Q1 Answer: A    Q2 Answer: B

COMPARING AN EXISTING ADMISSION MEDICATION HISTORY PROCESS WITH BEST PRACTICES: IDENTIFYING MEDICATION DISCREPANCIES IN A QUALITY IMPROVEMENT STUDY. Lauren McCaulley, Matt Hubble, Mercy Medical Center, 1111 6th Ave., Des Moines, IA 50314. LMcCaulley@mercydesmoines.org

Medication reconciliation has become an area of intense scrutiny by the Joint Commission since adding it to the Hospital National Patient Safety Goals in 2005. In order to perform quality medication reconciliation, it is crucial to obtain an accurate and complete medication history for each patient upon admission. The objective of this study was to identify areas for improvement in the current admission medication history process by comparing to best practices.

Participants were selected from a list of patients admitted within the previous 24 hours to a telemetry unit or transitional care unit. Patients in critical care areas were excluded. After nursing staff recorded the patient’s admission home medication list, a pharmacist or pharmacy student compiled a complete home medication list using validated best practices. This consists of a patient interview and gathering a medication list from at least two sources in most cases and then comparing the various lists to create a “best possible medication history.” The medication lists from before and after the use of best practices were compared and discrepancies were identified, recorded, and classified by type.

A group of three practitioners (physician, nurse practitioner, and clinical pharmacist) will rate the potential harm of each discrepancy on a scale of one to three. Descriptive statistics will be used to evaluate outcomes. The results from this study will be used to develop and promote staff education programs and patient safety initiatives within the Mercy health system.

Learning Objectives:
1.) Identify the key components of medication history best practices and describe how they can impact a health system.

Self Assessment Questions:
1.) Which of the following statements is true regarding best practices related to medication history?
   a. Asking open-ended questions during the patient interview is not recommended
   b. A patient’s own med list or medication vials should never be the only source of information
   c. In most cases, at least two sources should be used to gather medication information
   d. If a patient was recently hospitalized (within the past 6 months) and you have a discharge medication list, it is always acceptable to use that as the only source of information

Q1 Answer: C
In many observational studies, confounding is addressed using variables that indicate the presence of disease (ICD-9 codes). These codes, however, do not include information regarding the severity of that disease. Residual confounding could result in an over or under estimate of the true effect size. As an example, an analysis using Medicare data reported that rural patients with acute myocardial infarction (AMI), congestive heart failure (CHF), or pneumonia had poorer survival rates compared to urban patients. The authors were unable to control for differences in disease severity. The purpose of this study was to investigate whether differences in disease severity exist between rural and urban patients with the same diagnosis.

This retrospective chart review compares disease severity between patients admitted to rural hospitals and an academic medical center with a principal diagnosis of COPD or community acquired pneumonia (CAP). Disease severity was measured using the Comprehensive Severity Index (CSI). Severity criteria measured by the CSI are disease-specific and their values to compute CSI depend on the extent of abnormality of the physiologic-based signs, symptoms, and physical findings relevant to each of a patient’s ICD-9-CM codes.

The urban sample consisted of 50 patients admitted between April and December 2013 for acute care admissions at The Nebraska Medical Center. A similar rural sample was collected over the same time period at eight hospitals as part of a separate ion safety study. Differences in severity will be evaluated in an appropriate way based on monitoring parameters. The protocol will allow pharmacists to review each order for an ESA to determine whether or not administration is appropriate with regards to safety and efficacy. The pharmacist will be able to verify the order without changes, consult the physician for further information prior to authorization, or stop the order if inappropriate for use and consult the physician.

To evaluate if the implementation of the pharmacist-driven protocol for the use of erythropoietin-stimulating agents (ESAs) increases appropriateness of use with regards to standards set by the Food and Drug Administration, American Society of Clinical Oncology, Kidney Disease Outcome Quality Initiative and Center for Medicaid and Medicare Services.

A protocol developed by the investigation team was used to evaluate orders retrospectively for ESAs over the past ninety days on appropriateness of use. Data collected includes indication for use, product choice, hemoglobin, hematocrit, blood pressure, ferritin, transferrin saturation, and the number of interventions made over the course of the study. The protocol will be then used to evaluate prospective orders with pharmacist intervention over a course of ninety days. The protocol will allow pharmacists to review each order for an ESA to determine whether or not administration is appropriate with regards to safety and efficacy. The pharmacist will be able to verify the order without changes, consult the physician for further information prior to authorization, or stop the order if inappropriate for use and consult the physician.

An analysis of the retrospective data versus prospective data will observe for changes in appropriate ESA use and number of pharmacist interventions.

Learning objectives:
1.) Describe why regulation of erythropoietin-stimulating agent use is needed
2.) Recognize appropriate versus inappropriate use of erythropoietin-stimulating agents with regards to safety and efficacy based on monitoring parameters

Self Assessment Questions:
1.) Why might regulation of erythropoietin-stimulating agent use be warranted?
   a. ESAs have high abuse potential
   b. ESAs are considered high-risk medications due to cardiovascular risk
   c. ESAs are easily dosed and require very little monitoring
e. None of the above, ESAs are very safe and do not require monitoring.

2.) JC is a 49 yo AAF presenting for hemodialysis for her end-stage renal disease. She has an order for epoetin-alfa due to anemia of chronic disease. Which of the following may cause a pharmacist to question administration of the ESA?
   a. Iron studies take 2 weeks ago showed normal ferritin and TSAT levels
   b. Blood pressure within 24 hours of 148/92 mmHg
   c. Hemoglobin and hematocrit within 24 hours of 12.2 g/dL and 36.7%
d. None of these, the pharmacist should verify the order as is and the ESA should be given

Q1 Answer: B  Q2 Answer: C
Invasive fungal infections are responsible for significant patient morbidity and mortality, as well as a high cost burden. The IDSA reports that the attributable mortality of invasive candidiasis is likely somewhere between 15-25% for adults, 10-15% for neonates and children. It is further reported that the cost associated with each episode of invasive candidiasis in a hospitalized adult is approximately $40,000. Given the impact invasive fungal infections have on patients and the health care system, choosing appropriate empiric therapy is critical.

The primary objective of this study is to determine the most common causative organisms grown from positive sterile site fungal cultures within the Unity Point Health-Des Moines health system, as well as the corresponding susceptibilities. Secondary objectives include: determination of the appropriateness of empiric antifungal therapy initiated, identification of potential predisposing risk factors, and evaluation of clinical outcomes.

A retrospective chart review was performed of all adult non-cardiac inpatients with an episode of acute hypertension that resulted in administration of nitroglycerin ointment. Descriptive statistics were performed to evaluate effectiveness of nitroglycerin ointment as a treatment for acute hypertension and an inferential statistical analysis (i.e., hierarchical regression modeling) performed to examine predictors of blood pressure changes in patients after use of nitroglycerin ointment.

Results of the study will provide perspective on nitroglycerin's place in therapy for acute hypertension and will ideally lead to better evidenced-based treatment options for acute hypertension in the hospital setting.

Learning Objectives:
1) Report the results of nitroglycerin ointment as a treatment choice for acute hypertension in the hospital setting.

Self-Assessment Questions:
1. As demonstrated in the study, the only variable found to have a significance in the effectiveness of nitroglycerin ointment was
   A. Amount of nitroglycerin ointment applied
   B. Age of the patient
   C. Initial blood pressure
   D. Weight of the patient

Q1 Answer: C