

## **SELECTING AN APPROPRIATE DOCUMENTATION SYSTEM FOR A COMMUNITY PHARMACY PRACTICE SETTING**

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**Statement of Purpose:** To develop a systematic tool which evaluates patient care documentation systems available for community pharmacists.

**Methods:** Surveys were mailed to community pharmacists to assess their current use of patient care documentation systems, and the positive and negative aspects of their current systems. Survey data will be analyzed and used to develop a systematic tool. This tool will be utilized to review the current computerized systems commercially available for the documentation of pharmacy patient care services. A summary of this evaluation process, including a resource comparing the characteristics of the documentation systems, will be compiled and disseminated to community pharmacists.

**Results:** One hundred twenty five surveys have been sent to community pharmacists. Data is currently being collected.

**Conclusion:** This project will draw from the experiences of pharmacists in the community pharmacy setting, result in a tool that will systematically review the current patient care documentation systems, and aid pharmacists in the selection of an appropriate patient care documentation system to encourage the expansion of the role of pharmacists as patient care providers.

### **Learning Objectives:**

Explain the importance of documentation of pharmacy patient care services

Describe the process of performing a needs assessment when selecting a documentation system for a community pharmacy practice site

### **Self Assessment Questions:**

True or False Documentation of pharmacy patient care services can be important to demonstrate the value of the pharmacist's time spent with the patient.

True or False Assessing the needs of the community pharmacy practice site is not necessary when selecting a documentation system for the practice site.

## **RELATIONSHIP OF LORAZEPAM DOSE TO PROPYLENE GLYCOL CONCENTRATIONS IN THE CRITICALLY ILL**

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**Introduction:** Hyperosmolarity and anion gap metabolic acidosis have been described in association with continuous infusions of lorazepam (LZP). This has been attributed to propylene glycol (PG), a colorless, odorless fluid commonly used as a preservative or solvent in many injectables. The relationship between LZP dose and serum PG concentrations has never been prospectively studied. Furthermore, the true incidence of, and the LZP dosing threshold for PG toxicity is not well defined.

**Objectives:** Primary objective - to evaluate the LZP dose to PG concentration relationship. Secondary objectives - to document the occurrence of PG toxicity associated with high-dose (greater than or equal to 10 mg/hr) LZP infusion, as well as, to identify the dose of LZP, serum PG concentrations, and patient-related risk factors that correlate with the development of PG toxicity.

**Methods:** Patients admitted to the MICU over a 3-month period who are placed on a high-dose LZP infusion during their stay will be included. Patients will be excluded if they are receiving other medications that contain PG or if they are undergoing dialysis. The hourly and cumulative LZP dose will be documented and serum PG concentrations will be drawn once a stable LZP dose (defined as greater than or equal to 10 mg/hr for 48 hours) has been reached. PG toxicity will be assessed and defined based on the presence of 1) metabolic acidosis, 2) high anion gap (>15), and, 3) elevated osmolal gap (>10 mOsm/kg/H<sub>2</sub>O).

**Results:** To date, nine patients have been screened for eligibility. Of these patients, four have met inclusion criteria. Laboratory findings consistent with PG toxicity were observed in one out of four patients. Metabolic acidosis was observed in one patient, high anion gap in one patient, and elevated osmolal gap in four patients. Evaluation of the relationship between LZP dose and serum PG concentrations is ongoing.

### **Learning Objectives:**

To describe the primary laboratory and clinical manifestations associated with propylene glycol toxicity.

To understand the relevance of establishing a relationship between the dose of lorazepam, serum propylene glycol levels, and the development of propylene glycol toxicity in the medical intensive care unit population.

### **Self Assessment Questions:**

The primary laboratory manifestations that have been described with propylene glycol toxicity, include:

- (a) Anion gap metabolic acidosis
- (b) Hyperosmolarity
- (c) Elevated osmolal gap
- (d) All of the above

Patients placed on a high dose lorazepam infusion (greater than or equal to 10 mg/hr) may be receiving more than 40 times the acceptable amount of propylene glycol that is recommended by the World Health Organization.

- (a) True
- (b) False

## **EVALUATION OF CONGESTIVE HEART FAILURE MEDICATIONS IN CARDIAC RESYNCHRONIZATION THERAPY**

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Several randomized and placebo-controlled studies have shown that aggressive medical therapy delivered in a Congestive Heart Failure (CHF) Clinic model has reduced all cause mortality and morbidity rate by up to 50% in Class III-IV CHF patients. The American College of Cardiology (ACC) and American Heart Association (AHA) Taskforce on the treatment of CHF has recommended optimum medical therapy in combination with other adjunctive interventions in treating CHF. The present study was designed to assess the rate of compliance with the ACC and AHA guidelines for CHF treatment in a large private practice cohort receiving cardiac resynchronization therapy (CRT).

The study population was identified via electronic search and an open chart review of all CHF Clinic patients receiving CRT from 2000 to 2002 [key word: biventricular; pacer, defibrillator, implantation, revision and upgrade]. All biventricular pacer patients with or without defibrillator were included in the study. CHF medications prescribed, NYHA CHF class, and the percentage of patients not receiving optimum medical therapy according to the above guidelines are being evaluated. Clinically significant improvements in NYHA CHF class, medication usage, Improved Quality of Life, and rate of re-hospitalization are part of the primary end points. Mortality and morbidity data are being reviewed as secondary endpoints.

Educational and preliminary data on CHF medication appropriateness, compliance data and population demographics from this study will be presented at Great Lakes Residency Conference and overall results will be published.

### **Learning Objectives:**

To be able to assess medical therapy appropriateness in CHF Clinic model and identify the percentage of patients in compliance with the ACC and AHA guidelines.

Short-term assessment of mortality and morbidity data of the combination of CRT and aggressive medical therapy in Class III-IV CHF patients.

### **Self Assessment Questions:**

Despite up to 50% reduction in mortality and morbidity by aggressive medical therapy, many patients treated at CHF Clinic setting are not receiving optimum medical therapy. True False

National average of all cause mortality in CHF patients is about 10%. What percentage of these patients die from sudden cardiac death?

[a] 25% [b] 40% [c] 50% [d] 60%

## **EVALUATION OF ENOXAPARIN-ASSOCIATED RETROPERITONEAL, ABDOMINAL AND PELVIC HEMATOMAS**

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Enoxaparin (Lovenox®) is a widely used anticoagulant for the prophylaxis and treatment of DVT/PE and for the treatment of acute coronary syndromes. It has also been studied for use in atrial fibrillation and as bridge therapy while withdrawing warfarin therapy. Enoxaparin is well tolerated with the most common side effect being injection site bleeding. However, there have been case reports of life-threatening hematomas. The purpose of this project was to identify similarities that exist among patients who experience retroperitoneal, abdominal or pelvic hematomas while on enoxaparin, and to further identify these similarities as possible risk factors for this adverse effect.

Initial review identified ten patients who experienced a retroperitoneal, abdominal or pelvic hematoma while on enoxaparin between January 1996 and February 2003 at Meriter Hospital. Patients were identified through the pharmacy adverse reaction database and the medical records department. A retrospective chart review was conducted of these ten patients plus thirty patient controls matched by age, gender, enoxaparin dose and duration of therapy. Of the ten cases, 70% were female and 90% were receiving concurrent anticoagulant therapy. Fifty percent of patients had medical histories significant for atrial fibrillation, renal insufficiency, and previous DVT/PE event. Additionally, fifty percent were dosed incorrectly for their renal function.

Final conclusions on patient risk factors for enoxaparin-associated hematomas will be presented at the Great Lakes Pharmacy Residency Conference.

### **Learning Objectives:**

Identify patients on enoxaparin at risk for developing life-threatening hematomas.

Provide education to health-care providers on enoxaparin-associated hematomas.

### **Self Assessment Questions:**

Antifactor Xa levels were elevated in all patients who experienced enoxaparin-associated hematomas. T/F  
Enoxaparin was dosed correctly in all patients at Meriter Hospital. T/F

**MEDICATION ASSISTANCE PROGRAMS IMPROVE COMPLIANCE, DECREASE HOSPITALIZATIONS AND DOCTOR VISITS IN INDIGENT PATIENTS WITH ASTHMA**

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**BACKGROUND:** Asthma is a chronic debilitating illness that accounts for a considerable amount of morbidity and mortality in the United States. The number of patients diagnosed with asthma has been steadily increasing over the years. The precise reason for this increase is unknown. Early exposure to allergens, airway irritants, and worsening air quality increases the risk of developing asthma. Chicago has an alarmingly high incidence of patients suffering from asthma. Many indigent patients seek treatment through emergency rooms, due to limited means of healthcare. This contributes to the already high cost of healthcare. Miles Square Health Center is a community-based healthcare facility that provides health services to the city's impoverished. The purpose of this study is to show that the medication assistance program established by Miles Square affects patients' adherence with medications, decreases hospitalizations, physician and emergency room visits.

**METHODS:** This was a retrospective chart review of patients with a confirmed diagnosis of asthma. The patients included were seen at the Miles Square Health Center between July 1, 2001 to October 31, 2002. Data collected from chart included: increase knowledge of asthma and triggers, adherence with control medications, number of hospitalizations, and emergency room visits.

Data is currently being collected, and results will be presented at the conference.

**Learning Objectives:**

Describe effectiveness of Medication Assistance Programs  
Determine if adherence to control medications prevents asthma exacerbations.

**Self Assessment Questions:**

Asthma is a chronic debilitating illness. T or F  
Patients who only utilize short-acting beta agonist have increased number of emergency room visits. T or F

**THIAZOLIDINEDIONE USE IN THE VA CHICAGO HEALTHCARE SYSTEM: DETERMINING EFFECTIVENESS AND SAFETY**

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The American Diabetes Association has recommended that glycosylated hemoglobin (HbA1c) be maintained at < 7% in individuals with Type 2 diabetes mellitus (DM) for optimal glycemic control and prevention of progressive organ damage. Studies have shown that the thiazolidinediones (glitazones) are effective in reducing HbA1c. However, these agents are associated with fluid retention leading to congestive heart failure (CHF), and liver enzyme elevation. At the Veterans Affairs Chicago Health Care System (VACHCS), glitazones are not on the formulary as a consequence of the uncertainty of these agents in terms of long-term effectiveness and safety.

**PURPOSE:**

To determine how well the thiazolidinediones control blood sugar in diabetic patients within the VACHCS, and to assess how safe these agents are in this patient population.

**METHODS:**

Two hundred patients with a documented diabetes diagnosis code, and who were prescribed a glitazone from 01/01/98 – 10/31/02 were randomly selected for inclusion in this retrospective study. The following parameters were collected from patients' electronic charts and analyzed for trends: 1) demographics, 2) glitazone(s) prescribed/dose/regimen, 3) duration of therapy, 4) other anti-diabetic agents comprising treatment, 5) glycosylated hemoglobin: baseline, after 3 months, and yearly thereafter, 6) liver function tests: baseline, every 2 months for the first year of therapy, and periodically thereafter, 7) side effects experienced, 8) reason for discontinuation of therapy, if applicable, 9) co-morbid conditions.

**Learning Objectives:**

Discuss the effectiveness of the thiazolidinediones in reducing glycosylated hemoglobin.  
Identify the toxicities associated with thiazolidinedione use.

**Self Assessment Questions:**

The thiazolidinediones can reduce glycosylated hemoglobin by as much as \_\_\_\_\_ %.  
What is the most common side effect associated with thiazolidinedione use?

## **INFECTION CONTROL ANALYSIS: MULTI-DRUG RESISTANT GRAM NEGATIVE BACILLI**

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Gram-negative bacilli are major nosocomial pathogens. Emergence of multi-resistant strains has created difficulty by decreasing the antibiotics available to treat infections. The purpose of our study was to determine the risk factors for multi-drug resistant organisms within our hospital system.

A retrospective chart review was conducted from January to November 2002 on patients with a positive culture for a multi-drug resistance gram-negative rod (MDR GNR), as determined by criteria used by Infection Control within our hospital system. The gram-negative rods are split into two classes by Infection Control, the type 1 beta-lactamase producers (Group 1) and the extended spectrum beta-lactamase producers (Group 2). Infection Control classifies Group 1 organisms as multi-drug resistant if they are resistant to all classes of beta-lactam antibiotics or all of the aminoglycosides. Group 2 organisms are considered multi-drug resistant if they are resistant to 3rd generation cephalosporins. Several parameters assessing risk factors and impact were monitored for each patient. A total of 53 isolates were obtained, with 64% positive for multi-drug resistant *Pseudomonas aeruginosa*. Greater than 50% of the isolates were obtained from sputum or wound/drainage cultures and were deemed infectious. Patients that transferred from an outside hospital or extended care facility (ECF) made up 53% of all patients with a MDR GNR. Antibiotic use, specifically 3rd generation cephalosporin use, was high in this patient population. Overall, there was a 27% mortality rate for all patients infected or colonized with a MDR GNR.

Risk factors at our institution included transfer from an ECF, increased use of antibiotics and use of 3rd generation cephalosporins. Utilizing the known risk factors will help tailor further infection and antibiotic control measures to decrease resistance.

### **Learning Objectives:**

Summarize major multi-drug resistant pathogens important to the hospital system.

Understand the mechanisms of resistance for different classes of multi-drug resistant gram-negative bacilli.

### **Self Assessment Questions:**

Gram-negative bacilli are important nosocomial pathogens. T or F

Risk factors for acquisition of a multi-drug resistant pathogen include transfer from an ECF. T or F

## **RETROSPECTIVE EVALUATION OF THE SAFETY OF DALTEPARIN V. ENOXAPARIN IN THE NEUROSURGICAL POPULATION AFTER CRANIOTOMY**

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Deep venous thrombosis (DVT) and pulmonary embolism (PE) are common life-threatening manifestations of neurosurgery. Without prophylaxis, the incidence of symptomless DVT ranges between 20-50% and fatal PE occurs in 1.5 to 5% of patients. Historically, unfractionated heparin and sequential compression devices were used first line to prevent these complications; however, with the introduction of low molecular weight heparins (LMWH), the treatment focus has changed. Unfortunately, the literature is sparse, and no head to head comparisons of any LMWH exists in the neurosurgical population. Therefore, we plan to retrospectively compare Dalteparin and Enoxaparin in their safety when used for the prophylaxis of DVT/PE in patients after craniotomy.

This retrospective study will look at all neurosurgical patients that were placed on thromboembolic prophylaxis with a LMWH between June of 2000 and March of 2003. Currently, all patients admitted to the neurosurgical intensive care unit or the neurology floor in the time frame presented and treated with a LMWH, as prophylaxis following a craniotomy, were included into this study.

The primary outcome of this study will be the safety of dalteparin in comparison to enoxaparin in craniotomy patients. This safety shall include: major bleeds, minor bleeds and thrombocytopenia. Major Bleeds are defined as intracranial hemorrhages with mass effect on cranial CT or requirement of evacuation in the OR. Clinically overt bleeds were also included under major bleeds and defined by a decrease in hemoglobin of greater than 2g/dL or requiring at least 2 units of packed red blood cells. Minor bleeds were defined as anemias without overt bleeding, hematomas, and hematuria. Thrombocytopenia was defined by either less than 100,000 platelets or a drop in platelets, from baseline, greater than 50%. Secondary outcomes include a comparison of the efficacy of both LMWH in preventing a DVT or PE in relation to previous literature.

### **Learning Objectives:**

To determine if there is any difference in safety between dalteparin and enoxaparin in patients post craniotomy

To evaluate the impact of choosing one LMWH for formulary in non-FDA approved indications

### **Self Assessment Questions:**

Both dalteparin and enoxaparin have FDA approved indications for the prophylaxis of patients post craniotomy. T or F

Current literature clearly defines that one LMWH is superior to all others in its use for prophylaxis in craniotomy patients. T or F

## **INTRAVENOUS PROTONIX DRUG USE EVALUATION**

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Purpose: Institutional use of intravenous Protonix (Pantoprazole) is being examined to determine trends in patient characteristics that are receiving Protonix intravenously. Also being assessed through this drug utilization evaluation is what indication intravenous Protonix is being ordered for, what dosing regimen is being used, how many doses of the drug the patient has received and which physicians have ordered the medication. After collecting the data, the cost of intravenous Protonix daily therapy will be compared to what the cost would have been if intravenous Ranitidine had been substituted. Intravenous Protonix has been limited due to a nation wide supply shortage that is foreseeable through at least mid 2003 and the cost of the intravenous Protonix has increased substantially within the last few months. Due to reasons previously described, alternatives for intravenous Protonix should be examined. Stress ulcer prophylaxis is one of the indications for which intravenous Protonix has been ordered in recent history at our institutions. An alternative to intravenous Protonix is intravenous Ranitidine. There are currently no clinical trials to support the use of intravenous Protonix over intravenous Ranitidine for stress ulcer prophylaxis. The drug utilization evaluation will help determine what the characteristics are of the patients receiving intravenous Protonix, the indications it is being given for and the potential cost savings of substituting intravenous Ranitidine.

Methods: Drug utilization evaluation will be completed at Appleton Medical Center and Theda Clark Medical Center. The retrospective portion will include gathering data from charts from December 2002 and January 2003, and the prospective portion includes data from February 2003 and March 2003.

Preliminary results: Intravenous Protonix is being ordered for patients with increased serum creatinine as well as the elderly. Initial cost comparisons show a substantial cost reduction if intravenous Ranitidine had been substituted for intravenous Protonix.

Conclusion: Data still pending.

### **Learning Objectives:**

Discuss the characteristics of patients that were receiving intravenous Protonix at the two hospitals during the duration of the drug utilization evaluation.

Discuss the financial impact that the intravenous proton pump inhibitor versus the financial impact that Ranitidine intravenously would have.

### **Self Assessment Questions:**

What percentage of cost would be saved if intravenous Ranitidine had been used instead of intravenous Protonix during the drug utilization evaluation?

What are the most common indications that intravenous Protonix had been written for over the course of the drug utilization evaluation prior to notification of the drug shortage and after?

## **THE DEVELOPMENT AND IMPLEMENTATION OF A CLINICAL SHIFT IN A COMMUNITY PHARMACY**

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Development and implementation of a clinical shift to improve patient care, strengthen available clinical services, and provide an avenue for future reimbursement in a community pharmacy will be described. Pharmacists have been providing clinical services in the hospital and clinic setting. Current practice advancements include expanding the scope of clinical services to the community setting. A variety of clinical services, diabetes and asthma management, blood pressure and osteoporosis screenings, and immunizations are available at St. Luke's Outpatient Pharmacy. Due to lack of time and personnel, the services have not been optimized. Thus, the scheduling of a pharmacist to solely provide these services is a priority. Redefining the staff's assigned job responsibilities and workflow and identifying the best time to schedule the clinical shift were among the first steps taken. Secondly, the available clinical services were reviewed and updated and a resource guide containing program standards, patient goals, and reference materials for each of the clinical services was compiled. Methods for consistent patient documentation and communication between clinical shift pharmacists were created. The service was marketed to patients by pharmacy staff referrals and promotional materials. The clinical shift was piloted in March. Changes in workflow, available services and daily activities were made based on collective feedback from the clinical shift pharmacists. Lastly, research into the development of future clinical services and reimbursement strategies will be undertaken.

### **Learning Objectives:**

Understand the impact of pharmacy workflow on the success of the clinical shift

Be able to identify barriers to the development and implementation of the clinical shift

### **Self Assessment Questions:**

True or False. Two technician order entry was an essential workflow modification in the implementation of the clinical shift.

The following were identified as barriers to the development and implementation of the clinical shift.

- Scheduling shortages
- Differences in technician order entry skills
- Lack of clinical service pharmacist training
- Documentation and communication between clinical shift pharmacists
- All of the above

## **IMPROVING ADVERSE DRUG REACTION REPORTING AT A VA MEDICAL CENTER**

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Although the concept of ADR reporting is not new, many institutions still struggle with underreporting. A Process Improvement Team at the VA Ann Arbor Healthcare System (VAAHS) has identified this problem and recognized the need to improve the current system of reporting. ADR reporting has relied almost entirely on pharmacists with few reports coming from front-line providers such as physicians and nurses. In an effort to increase the number of reports and to increase interdisciplinary involvement, new methods of reporting were developed. Prior to implementation, methods of reporting included Medwatch forms and telephoning pharmacists. ADRs were also retrospectively collected through E-code reviews of discharge notes and quarterly reports from the Allergy Tracking System.

Following the Institute of Healthcare Improvement's model for rapid change, best practices were identified and tested to accommodate the needs, demands, and barriers of ADR reporting at the VAAHS. In October 2002, an online reporting system via the VAAHS's Computerized Patient Record System (CPRS) and a hotline was introduced. These new systems were promoted via newsletters, fliers, and periodic inservices. To further increase awareness and interdisciplinary involvement, a computerized educational module was developed for continuing education credit for providers at VAAHS.

Since implementation of the new methods, the number of ADR reports as well as interdisciplinary involvement has substantially increased. In 2001, a total of 118 ADRs were reported, with approximately 80% of the reports coming from pharmacists. The total number of ADRs in 2002 increased to 268 reports with approximately 60% of the reports coming from pharmacists and 40% from other healthcare providers. Specifically, from October to December 2002, 113 ADRs were reported, with approximately 70% of the reports coming from the new CPRS system. Data analysis is currently in progress.

### **Learning Objectives:**

To understand the importance and necessity of ADR reporting

To describe processes for developing and implementing new methods of ADR reporting

### **Self Assessment Questions:**

ADRs account for approximately 8-10% of all hospital admissions

It is the responsibility of all healthcare providers to detect and report ADRs

## **PHARMACOKINETICS OF DIGOXIN IN MEN VERSUS WOMEN: SEX-BASED OR DRUG INTERACTIONS?**

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Sex-based differences are reported for several genomic factors, such as drug transporters and drug-metabolizing enzymes. Since transporters and enzymes play a major role in drug disposition, varied levels of expressions between individuals can easily alter pharmacokinetics and/or pharmacodynamics of substrate drugs. The significance of these findings in clinical practice has not been determined.

The 1997 Digitalis Investigation Group (DIG) trial reported on digoxin's efficacy in heart failure patients. Recently, Rathore SS, et al. published a subgroup analysis of data from the DIG trial, showing differences in mortality between men and women. The study suggested an increased risk of death among women who were treated with digoxin, but not among men. One hypothesis to explain these findings would be a disparity of digoxin pharmacokinetics between men and women. Another hypothesis would be a drug-drug interaction between digoxin and progestin in women receiving hormone-replacement therapy (HRT). It was proposed that P-gp, which regulates renal tubular secretion and the extravascular tissue distribution of digoxin, might have been inhibited by progestin resulting in an increased serum digoxin level. However, based on the available data, the mechanism behind different effects of digoxin on mortality between men and women is still uncertain.

This study is a retrospective review of the medical record. All patients received digoxin at the University of Illinois Medical Center from January 1, 2000 to December 20, 2002 whose medical records are retrievable are eligible in the study. Then Inter-subject comparison will be performed between men vs. all women, women w/ HRT vs. women w/o HRT, and men vs. each women subgroup. Statistical comparison will be conducted using ANOVA for continuous variable. Data collection is currently in progress and the final results will be presented in the Great Lakes Conference.

### **Learning Objectives:**

To determine whether there are sex-based differences in pharmacokinetics of digoxin.

To assess whether there is a disparity of pharmacokinetics of digoxin in women with HRT compared to those without HRT.

### **Self Assessment Questions:**

The expression of the cytochrome P450 (CYP) 3A isoenzymes has been shown to be different in men compared to women.  
True or False

It has been suggested that P-gp inhibition by medroxyprogesterone occurs at concentrations less than 5 M.  
True or False

## **PHARMACIST IMPACT IN THE SCREENING AND MANAGEMENT OF OSTEOPOROSIS IN A GERIATRICS CLINIC**

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Approximately one out of every two Caucasian women will experience an osteoporotic fracture at some point in her lifetime. The University of Louisville Healthcare, University Physicians' Group Geriatrics Clinic believes that osteoporosis is a disorder that is under evaluated and under diagnosed in their patient population. In the geriatrics clinic over the past 18 months, there were 9750 patient visits. Only 72 patients had a diagnosis of osteoporosis. The purpose of this study was to determine if a pharmacist could impact the screening and management of osteoporosis in this clinic.

The first phase of the study included a retrospective chart review to evaluate osteoporosis screening and treatment patterns. The Simple Calculated Osteoporosis Risk Estimation (SCORE), a validated osteoporosis screening tool, was used for risk assessment and a questionnaire was developed and used for data collection. Records of 101 randomly selected postmenopausal women seen from March 2002 to August 2002 were reviewed. Results from the first phase of this study showed that 76% of the patients reviewed were at risk for osteoporosis, thus reinforcing the need to improve screening in this clinic.

The second phase of this study consisted of the pharmacist interventions; physician education, development of patient education materials, and prospective risk screening and administration of the patient questionnaire. The risk screening and questionnaire were administered to women over the age of 50 seen in the clinic from January 2003 to April 2003. The pharmacist consented each patient before administering the questionnaire. The questionnaire was then utilized to determine which patients warranted further evaluation or treatment for osteoporosis. Data was then collected to determine if these patients had been properly evaluated and treated for osteoporosis. Data collected before and after the pharmacist's interventions were analyzed and compared.

### **Learning Objectives:**

Describe clinical interventions made by the pharmacist in the screening and management of osteoporosis.

Compare the utilization of non-pharmacologic and pharmacologic methods of osteoporosis screening and management before and after the pharmacist's interventions.

### **Self Assessment Questions:**

What are 3 risk factors for osteoporosis?

What are the screening methods and treatment options available for osteoporosis?

## **ASSESSMENT OF ANTI-ANGIOTENSIN THERAPY IN PATIENTS WITH DIABETIC NEPHROPATHY IN A PRIMARY CARE SETTING**

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The purpose of this study is to determine the proportion of proteinuric diabetic patients that are receiving anti-angiotensin therapy. According to the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI), the incidence and prevalence of end-stage renal disease (ESRD) have doubled in the past 10 years and are expected to continue to rise steadily. Total Medicare and non-Medicare costs for ESRD treatment in 1998 were \$12.0 billion and \$4.7 billion, respectively. Diabetic nephropathy, the most common cause of ESRD, follows a characteristic clinical course, first manifested by microalbuminuria, followed by clinical proteinuria, and declining glomerular filtration rate. Anti-angiotensin agents such as angiotensin converting enzyme inhibitors (ACE-I) and angiotensin receptor blockers (ARBs) have been shown to slow the progression of diabetic kidney disease. Delay in diagnosis and treatment of diabetic nephropathy results in missed opportunities to prevent progression of kidney disease. This study is a retrospective chart review of diabetic patients managed by the Internal Medicine Center of Akron for a period of 12 to 24 months. All diabetic proteinuric patients (>30 mg/day or equivalent) will be included unless they have a contraindication or intolerance to both ACE-I and ARBs or require renal replacement therapy including dialysis or kidney transplantation. Information to be collected will include: age, gender, race, anti-angiotensin therapy, comorbid conditions (hypertension, coronary artery disease, congestive heart failure, level of renal function (GFR <30 ml/min or >30 ml/min), and whether the patient was managed by a resident physician, private physician, or referred to a nephrologist. Data will be analyzed to determine the percentage of patients that were screened for proteinuria. For the proteinuric patients the likelihood of being on anti-angiotensin therapy and its correlation with comorbid conditions will be assessed.

Results /Conclusions: Forthcoming

### **Learning Objectives:**

To discuss the current guidelines for the diagnosis and treatment of diabetic nephropathy.  
To discuss the role of anti-angiotensin therapy in diabetic nephropathy.

### **Self Assessment Questions:**

Diabetic nephropathy is a progressive disease, and a patient's renal function can be expected to worsen over time. T or F  
Anti-angiotensin agents slow the progression of diabetic nephropathy. T or F

## **IMPACT OF THE DEVELOPMENT AND IMPLEMENTATION OF G-CSF STANDING ORDER FORM IN A CANCER INSTITUTION**

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Filgrastim, a granulocyte colony-stimulating factor (G-CSF), is used to reduce the severity and duration of neutropenia induced by chemotherapy. It has shown to decrease the incidence of infection, duration and cost of hospitalization related to febrile neutropenia. At Harper University Hospital and Karmanos Cancer Institute, filgrastim has been a high-cost and high-volume medication. A G-CSF standing order form, based on the American Society of Clinical Oncology (ASCO) G-CSF guidelines, was developed through a multidisciplinary team effort and implemented in both inpatient and outpatient settings starting October 2002. The order forms are reviewed prospectively with the primary objective of ensuring appropriate use of filgrastim. Secondary objectives include the economic impact and the feasibility of using the order forms.

As the primary objective, prescribers are mandated to indicate the rationale for using G-CSF on the order form. Additionally, a specific target absolute neutrophil count must be selected as an automatic discontinuation for nurses and pharmacists.

Through January 31st, 2003, a total of 82 G-CSF order forms for 72 cancer patients were reviewed, including 38 inpatients and 44 outpatients. In the inpatient setting, 28 followed ASCO guidelines (74%) and 5 did not (13%). Five G-CSF orders were used outside the scope of the guidelines (13%) and 7 pharmacy interventions to discontinue filgrastim were recorded. In the outpatient setting, 33 followed the guidelines (75%) and 11 did not (25%). No pharmacy intervention was recorded.

The G-CSF standing order form assures appropriate use of filgrastim in both inpatient and outpatient settings. However, limited benefit is observed in the outpatient setting. Further follow up is required to observe an improvement in the adherence to the ASCO G-CSF guidelines.

### **Learning Objectives:**

Understand the impact of chemotherapy-induced neutropenia in cancer patients.  
Apply ASCO guidelines to ensure appropriate use of G-CSF in cancer patients.

### **Self Assessment Questions:**

Filgrastim has shown to improve survival in the treatment of cancer. T F  
Filgrastim is used to reduce the severity and duration of neutropenia induced by chemotherapy. T F



## **A PILOT TRIAL OF DEXMEDETOMIDINE AS AN ANALGESIC AND SEDATIVE AGENT POST GASTRIC BYPASS SURGERY**

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The incidence of obesity is increasing in widespread proportions in the United States. At this time, surgery offers the potential for substantial and sustainable weight loss, but it does not go without risks. Respiratory insufficiency associated with morbid obesity accounts for almost 12% of patients who undergo gastric bypass surgery. Therefore, it is essential in the perioperative period to reduce the incidence of respiratory depression. Patients after surgery often require sedation and analgesia which may further impair respiratory function. Opioid analgesics and benzodiazepines are currently being used which can adversely affect respiratory drive. Dexmedetomidine is an agent that has both sedative and analgesic properties with minimal effect on respiratory function. The objective of this study, therefore, is to assess the efficacy of dexmedetomidine versus conventional sedation/analgesia in patients after gastric bypass surgery.

A prospective, randomized pilot trial of 10 patients admitted to the surgical intensive care unit (SICU) after open or laproscopic gastric bypass surgery who had at least 6 hours ventilatory support and body mass indices >40 kg/m<sup>2</sup> were included in this study. Patients were randomized to receive dexmedetomidine 1 mcg/kg loading dose followed by 0.5-1 mcg/kg/hr or conventional sedation/analgesia. Postoperative sedation/analgesia was determined at the discretion of the primary surgical service. Sedation was titrated to a goal Ramsay score of 3 while intubated and 2 following extubation. Doses of rescue medications in the form of sedatives or analgesics were recorded (mg/day) for patients receiving dexmedetomidine. The primary outcome of this study was time on the ventilator (hours), time in the SICU (days), and need for additional sedatives/narcotics. Secondary endpoints included the need for restraints.

The results and conclusions of this study will be presented at the conference.

### **Learning Objectives:**

Understand the role of dexmedetomidine as an analgesic and sedative after gastric bypass surgery.  
Describe the benefits of using dexmedetomidine postoperatively in gastric bypass surgery patients.

### **Self Assessment Questions:**

What is the primary benefit of dexmedetomidine compared to conventional sedatives/analgesics?  
What hemodynamic parameters should be monitored in patients receiving dexmedetomidine?

## **GROUP VISITS VS. INDIVIDUAL APPOINTMENTS IN A POINT-OF-CARE ANTICOAGULATION CLINIC**

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Studies have documented the benefits of group health care visits and evaluated provider and patient satisfaction with this model. These data suggest that this practice will provide a comfortable environment for patients to express their concerns and for providers to educate without increasing workload or time. Although the results were studied in several different practice settings, medical literature searches did not yield any studies pertaining to group visits and anticoagulation. The purpose of this study is to compare the clinical effectiveness and safety of a group visit anticoagulation model with an individual point-of-care anticoagulation model. A secondary objective is to determine the overall patient satisfaction with a group visit model and the rationale behind patient disinterest in participating in group visits.

Patients who were eligible for study participation must have been taking warfarin for at least thirty days and have a goal INR supported by CHEST guidelines. Patients were then randomly selected. The first fifty patients who agreed to participate were enrolled in group visits. Those who declined participation were asked to identify the reason(s) for non-participation. One assessment of the safety and effectiveness of group visits will be using a computerized database analysis to calculate the percentage of patients within goal INR range. Such measurements will be compared to data from eligible patients who attended individual appointments.

Of 270 patients within the anticoagulation service, there were 166 patients who fit the above criteria. To date 67 patients have been asked to attend group visits and 44 patients (26.5%) have declined participation. Of patients who declined participation, the primary reasons identified were: inconvenient day (0%), inconvenient time (36.3%), prefer individual attention (29.5%), uncomfortable / concerned with confidentiality (0%), inconvenient duration of visit (13.6%), and lack of interest in educational sessions (6.8%). Additional data will be available as the study continues.

### **Learning Objectives:**

Identify the advantages and disadvantages of group visits for patients and providers.  
List potential reasons why patients may not be interested in participating in group visits.

### **Self Assessment Questions:**

Literature suggests one potential disadvantage when implementing group visits into practice may be increased cost. T F  
Confidentiality is a major concern for most patients when considering group visits. T F

**PROSPECTIVE ANALYSIS OF PATIENT PERSISTENCE TO COMBINATION INTERFERON ALFA-2B AND RIBAVIRIN THERAPY FOR THE TREATMENT OF CHRONIC HEPATITIS C**

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The purpose of this study was to assess the effectiveness of a pharmacist-managed program for patients taking combination interferon alfa-2b and ribavirin therapy for the treatment of Chronic Hepatitis C.

This study was a prospective, controlled, descriptive study of a pharmacist-managed adherence program for combination interferon alfa-2b and ribavirin therapy. Patients who filled a prescription for combination interferon alfa-2b and ribavirin therapy during the study period of August 2000-December 31, 2001 were eligible to enroll in the study. Patients not naïve to therapy were excluded from the study. Patients were placed in either the intervention group or the control group. The intervention group received a series of phone calls over the course of their therapy. Patient compliance was measured from prescription claims records. Compliance was calculated by totaling the months of medication supplied to the patient during their predicted 1-year course of therapy. A patient was considered persistent if the study medication was dispensed to them in sufficient supply to be available in the reference month.

There were 854 patients from the intention-to-treat group included in this analysis and 384 control patients. There were 1966 contacts made to patients in the active group. The average number of contacts per patient was 2.3. The dropout rate in the control group after month one of therapy was 11% compared to 3% in the active group. The rate of persistence at month 6 for the control group was 59% compared to 72% in the active group. Only 12% of patients in the control group finished a full 12 months of therapy compared to 19% in the active group. Patients in the intervention group were significantly more persistent than the control group after 1 month and 6 months of combination interferon alfa-2b and ribavirin therapy.

**Learning Objectives:**

Describe combination therapy guidelines for the treatment of Chronic Hepatitis C.

Identify the significance of patient adherence to combination interferon alfa-2b and ribavirin therapy for the treatment of Chronic Hepatitis C.

**Self Assessment Questions:**

Patients not persistent with their combination interferon alfa-2b and ribavirin therapy for the treatment of Chronic Hepatitis C are considered to have failed therapy? T or F

A pharmacist-managed phone intervention program can impact persistency rates of patients to combination interferon alfa-2b and ribavirin therapy? T or F

## **DEVELOPMENT AND EVALUATION OF A SMOKING CESSATION PROGRAM IN AN HIV CLINIC**

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Cigarette smoking is a habit that can be harmful to HIV-positive individuals. It has been shown that counseling plus nicotine replacement therapy yields increased results versus trying to quit through just one of these methods alone. The purpose of this study is to develop, implement, and assess the effectiveness of an HIV clinic smoking cessation program.

A smoking cessation program was developed and implemented at Indiana University Hospital's HIV clinic. This program consists of four counseling sessions. During the first session questionnaires are completed assessing nicotine dependence and reasons for smoking, medical histories are obtained, patient's readiness to quit is assessed, a quit date is set if applicable, the medications for treating tobacco dependence are discussed, as well as the benefits of quitting smoking. At the remaining three sessions cessation status is reassessed and the patient is counseled according to the stage of cessation they are in. Follow up phone calls are initiated after the completion of the fourth counseling session. The content and design of the counseling sessions/follow up phone calls are based on recommendations from the Clinical Practice Guidelines for Treating Tobacco Use and Dependence provided by the U.S. Department of Health and Human Services in June 2000.

The Evaluation of this program assesses how well the current program aids patients in quitting smoking. Data evaluated includes gender, age, occupation, number of quit attempts, number of completed sessions, nicotine replacement therapy used, number of relapses that occur, and whether or not complete abstinence is obtained. In evaluating this data we hope to improve our program for future participants and contribute valuable information to the medical community on the usefulness of a smoking cessation program in an HIV clinic.

### **Learning Objectives:**

Discuss the need for a smoking cessation program in an HIV clinic.

Describe the types of nicotine replacement therapy offered.

### **Self Assessment Questions:**

Counseling, in addition to nicotine replacement therapy, is an important component in helping patients to become successful non-smokers. T/F

Few smoking cessation programs specifically target the HIV population. T/F

## **DEVELOPMENT AND IMPLEMENTATION OF AN INPATIENT HEART FAILURE MODEL**

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In the United States, more than 550,000 new cases of heart failure (HF) are diagnosed each year, and greater than 4.6 million patients currently live with this diagnosis. HF is the most commonly reported diagnosis related group (DRG) reported and accounts for 5-10% of all hospital admissions. Mortality in HF patients is reported at greater than 50% in five years.

The purpose of this model is to improve patient outcomes at Spectrum Health. The Acute Decompensated HEart failure national REgistry (ADHERE) database allows Spectrum Health to evaluate our performance in comparison to other institutions similar to ours. Upon examining data from the ADHERE database, we identified a need for improvement in measures including length of stay (LOS), documentation of left ventricular function, percentage of patients discharged on angiotensin converting enzyme (ACE) inhibitors with documented ejection fraction < 40%. The model involves the development of an admission order set specific to heart failure that would include guidelines for the dosing of ACE inhibitors, beta blockers, and other HF specific medications; a diuresis protocol that involved nurse assessment of symptoms and fluid status; and a potassium replacement protocol.

This inpatient HF model will undergo a pilot study on each of our cardiovascular units at the Spectrum Health - Butterworth and Blodgett Campuses in April with patients followed by a selected group of physicians. Data will be collected from the pilot trial measuring LOS, ACE inhibitor use, beta blocker use, nesiritide use, tobacco cessation counseling, physician calls, and adverse events. Following the pilot trial, the protocol will be revised and made available for use by all physicians. As follow up, we will use the ADHERE database to document the outcomes of implementation of this model. The next phase will involve evaluation of cost containment.

### **Learning Objectives:**

Describe the pharmacist's role in the development and implementation of an inpatient heart failure model.

List the JCAHO core measures for heart failure.

### **Self Assessment Questions:**

Left ventricular function (EF) documentation is not a core measure from JCAHO regarding HF. T or F

A Brain Natriuretic Peptide level > 1300 pg/mL is consistent with acutely decompensated HF. T or F

**CEFEPIME 2G Q8H VERSUS STEP-DOWN THERAPY TO CEFEPIME 1G Q8H AS EMPIRIC THERAPY FOR NEUTROPENIC FEVER IN BONE MARROW TRANSPLANT PATIENTS: A PILOT STUDY**

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Background: Patients who undergo a peripheral stem cell transplant (PSCT) or bone marrow transplant (BMT) are likely to develop neutropenic fever at some point during the course of their treatment. Cefepime is a fourth generation cephalosporin that has been approved for this indication. The approved dose in patients with normal renal function is 2 grams every 8 hours for 7 days or until resolution of neutropenia.

Our primary objective is to determine the efficacy of a lower dose of cefepime in the management of neutropenic fever in PSCT and BMT patients.

Methods: We plan to perform a prospective study with a historical control group (retrospective data will be collected by chart review) to examine step-down therapy from cefepime 2 g q8h to 1g q8h. The inclusion criteria will include hospitalized patients undergoing an autologous or allogeneic PSCT and BMT, age greater than 18 years, neutropenic fever, and are hemodynamically stable. When the patients develop neutropenic fever, cefepime 2g q8h by intravenous infusion will be initiated. At 72 hours, the dose will be changed to 1g IV q8h if the patient is afebrile, hemodynamically stable, and has no cultures positive for Gram-negative rods. The duration of treatment will continue until patient's neutropenia has resolved as defined by ANC > 500 neutrophils/mm<sup>3</sup> for 3 days or can be continued at the discretion of the physician. In order to minimize risk of infection, blood and urine cultures will be obtained, and vitals will be monitored daily.

Results: This research is currently in progress. From the results of our study we hope to determine a new dosing protocol for the use of cefepime in PSCT and BMT patients that is safe, efficacious, and may provide cost-saving.

**Learning Objectives:**

Discuss empiric treatment strategies for neutropenic fever in PSCT and BMT patients.

Understand the current rationale for cefepime step-down therapy in this patient population.

**Self Assessment Questions:**

What are the most common organisms encountered in febrile neutropenia?

What are the potential pros and cons of cefepime step-down therapy in this patient population?

**IMPLEMENTATION AND EVALUATION OF AN INTENSIVE CARE UNIT SEDATION PROTOCOL**

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**Background and Purpose:**

Sedation is a vital element in the care of mechanically ventilated patients who are anxious or agitated. Sedatives may be misused, resulting in under or over-sedation and unnecessarily prolonged mechanical ventilation. By initiating a sedation protocol that standardizes sedation selection, dosing, and monitoring, patients may receive more appropriate sedative agents, and over-sedation and subsequent complications may be avoided. The purpose of this study is to: 1) Create guidelines for sedative selection in the ICU, 2) Establish a standardized approach for monitoring and assessing sedation in mechanically ventilated patients in the ICU, and 3) Determine if the implementation of the sedation protocol results in a decreased need for extra bolus doses of sedation, decreased ventilator time, and decreased ICU length of stay.

**Methodology:**

A pharmacist-led multidisciplinary team developed a standardized approach for managing ventilator patients requiring continuous sedation in the ICU. A retrospective chart review will be conducted comparing guideline-managed patients to those who are on non-protocol driven sedation.

**Results:**

Data collection is in progress.

**Conclusion:**

Yet to be determined.

**Learning Objectives:**

Develop an understanding of the advantages of implementing a sedation protocol that standardizes sedation selection, dosing, and monitoring.

Develop an understanding that sedation monitoring helps to reduce potential complications.

**Self Assessment Questions:**

Which of the following statements is/are NOT true concerning sedation for mechanically ventilated patients?

- The level of sedation should be monitored and adjusted for optimum effects.
- Commonly used sedative agents include lorazepam and propofol.
- Patients respond differently to sedatives; therefore, the same dose of sedative may not be given to each patient.
- Haloperidol should always be the first agent started for sedation.
- All of the above.

ANSWER: D

True or false: It is impossible to achieve optimum sedation; therefore, the goal is to always over-sedate the patient.

ANSWER: False

## **PIPERACILLIN/TAZOBACTAM (ZOSYN®): APPROPRIATE USE OR OVERUSE?**

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Use of piperacillin/tazobactam (Zosyn®) at Froedtert Hospital has increased steadily over the past few years. The associated cost has also increased substantially over this time. Use of this broad-spectrum agent appears to be increasing and may lead to resistance, while other alternative agents may be more cost effective and more appropriate. Previous drug utilization evaluations (DUEs) have been performed at Froedtert Hospital and antibiotic guidelines have been developed by the Pharmacy, Nutrition, and Therapeutics Committee. However, past DUEs have not focused on opportunities to utilize more appropriate alternatives to Zosyn®.

This concurrent DUE has further evaluated the prescribing patterns and use of Zosyn® at Froedtert Hospital. Fifty patients initiated on Zosyn® were followed throughout their course of therapy. Cultures and sensitivities, and daily labs were recorded and followed, as well as clinical presentation and changes in antibiotic therapy. Opportunities to discontinue therapy or switch to a more appropriate antibiotic are being identified. Situations where there is a desire to have an antibacterial that will cover *Pseudomonas aeruginosa* empirically are especially being evaluated for appropriateness in terms of whether this bacteria should be empirically covered and whether the coverage is discontinued upon receiving cultures negative for *Ps. aeruginosa*. Upon completion of data analysis, the need for education will be assessed to emphasize the need to reserve anti-pseudomonal agents.

Zosyn® has a substantially higher budget impact than any other antibiotic currently used at Froedtert Hospital. This DUE will also examine areas where more cost effective agents may be used in place of Zosyn® to cover the desired organisms. The data will be used to assess and modify existing guidelines specific for our hospital to provide optimal patient care, while creating opportunities for cost savings. Resistance patterns are also being examined which may lead to more restrictive use of Zosyn® in the future.

### **Learning Objectives:**

To recognize opportunities to optimize antibacterial therapy, not only to decrease the risk of antimicrobial resistance, but also to decrease costs.

To understand the importance of streamlining antibacterial therapy.

### **Self Assessment Questions:**

Discuss one problem with overuse of broad-spectrum antibiotics.

What specific pathogen should Zosyn® be reserved for?

## **ASSESSMENT OF CLINICAL PHARMACY SERVICES IN AN EMERGENCY DEPARTMENT OF A COMMUNITY TEACHING HOSPITAL**

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The assessment of clinical pharmacy services in the emergency department is described for a 325-bed community teaching hospital. Clinical pharmacy services such as the provision of drug information and drug therapy monitoring have demonstrated value to patient care by optimizing drug therapy in various patient settings. Currently, decentralized clinical pharmacy services are not provided in the emergency department of the community teaching hospital. This study is designed to demonstrate that clinical pharmacy services in the emergency department can improve continuity of care for admitted patients, reduce medication errors, increase compliance with evidence-based medicine, reduce medication costs, and improve emergency department staff satisfaction with pharmacy services. First, clear objectives and expectations regarding implementation of clinical pharmacy services were established. Next, specific training and skills necessary to perform clinical pharmacy services were identified. Third, assessment tools were developed to identify pharmacy interventions, drug information requests, and emergency department staff perceptions and satisfaction of the clinical pharmacy services. Fourth, data collected will be evaluated to determine the impact of the clinical pharmacy services in the emergency department.

### **Learning Objectives:**

Describe and rationalize the need for clinical pharmacy services in the emergency department

Describe the specific training skills necessary to perform clinical pharmacy services in the emergency department

### **Self Assessment Questions:**

True or False- Decentralized clinical pharmacy services in the emergency department improved medication error reporting and awareness

Which of the following parameters were assessed during the evaluation of clinical pharmacy services in the emergency department at Aurora Sinai Medical Center?

- (A) Medication costs
- (B) Compliance with evidence-based disease management initiatives
- (C) Emergency department staff satisfaction with pharmacy services
- (D) All of the above parameters were assessed

**ADEQUACY OF CHRONIC KIDNEY DISEASE (CKD) MANAGEMENT IN AN AMBULATORY CARE PRACTICE NETWORK: ASSESSMENT FOR A RENAL MONITORING SERVICE IN COMMUNITY HEALTH CLINICS OF THE COLUMBUS NEIGHBORHOOD HEALTH C**

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Reduced kidney function poses significant public health concerns. Our study will determine if CKD is appropriately identified/staged for patients at high-risk in a primary care setting and identify opportunities for pharmacists to collaborate with physicians in monitoring kidney function and medications.

The investigator will review medical records of 200 indigent patients with diabetes mellitus and/or hypertension who visited CNHC from April-October 2002. After using laboratory values to identify/stage CKD, medications will be evaluated to make therapeutic interventions. Physicians will review findings, and acceptance rate of interventions will be evaluated.

To date, 41 patients have met the inclusion criteria. Mean (SD) age is 56.3 (11.8) years, weight 90.7 (26.4) kg, and number of current medications 6.2 (3.0). Average serum creatinine is 1.00 (0.4) mg/dL and estimated creatinine clearance 80 (32) mL/min. Of patients requiring urine protein concentrations, 65% excrete measurable amounts. Mean values for systolic and diastolic blood pressures are 130 (13) mmHg and 80 (11) mmHg, respectively, and HbA1c is 7.4 (2.7) %. CKD staging is as follows: 27% Stage 0, 12% Stage 1, 32% Stage 2, 24% Stage 3, and 5% Stage 4. Previous documentation of CKD in the medical record occurred in 7% of patients (none were staged); nephrology referrals were made in 2% of all patients. Ninety percent of patients require medication addition/deletion, 24% require medication strength adjustment, and 5% require dosing interval adjustment. Ninety percent of patients require updated laboratory values, and 50% require better blood pressure and/or glycemic control. Among patients who qualify, 49% are not prescribed an ACE Inhibitor. Data regarding acceptance of investigator recommendations is pending.

In conclusion, CKD is not being identified/staged in accordance with guidelines, and laboratory monitoring and disease management are not being optimized. Expanded pharmacy clinical services may be needed to improve care/prevent adverse events in high-risk patients.

**Learning Objectives:**

Discuss if CKD is being appropriately identified and staged in high risk patients with diabetes mellitus and hypertension in the primary care setting

Discuss pharmacist's impact in monitoring renal function and medications in patients with or at high-risk of developing CKD

**Self Assessment Questions:**

The disease state(s) that may contribute to the development of CKD is (are): a. chronic back pain, b. diabetes mellitus, c. asthma, d. hypertension, e. b and d

True/False. CKD does not have to be monitored until a patient requires dialysis.

**TRENDS OF GABAPENTIN USE FOR NEUROPATHIC PAIN FOLLOWING SPINAL CORD INJURY**

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Pain can be a common complication following spinal cord injury (SCI). Prevalence estimates range from 18% to 96% with one-third of this population rating their pain as severe. Tricyclic antidepressants and anticonvulsants have shown to be useful in the treatment of neuropathic pain. However, studies have reported that only a minority of patients presently on analgesic therapy rated their analgesic results as good or excellent relief with antidepressants, anticonvulsants, opioids and simple analgesics. Gabapentin (Neurontin®) was approved by the FDA in 1993 as adjunctive treatment of complex partial seizures and in 2002 for the management of postherpetic neuralgia in adults. At Hines VA Hospital, gabapentin is frequently prescribed in the off-label use for the treatment of neuropathic pain in patients with SCI.

The primary objective of this study is to review the use of gabapentin for neuropathic pain in SCI patients. The secondary objectives are to assess renal dosing, maximum dose prescribed, the use of concurrent medications for pain, and the efficacy of gabapentin for neuropathy. The results from this study will help determine the pattern of gabapentin use by the SCI service.

This study is a retrospective analysis of gabapentin use at Hines VA Hospital. Inpatient and outpatient subjects who had an active prescription of gabapentin prescribed by the spinal cord service from July 1st 2002 to September 30th 2002 were reviewed for both the primary and secondary objectives. Patients receiving gabapentin for any indication other than pain were excluded. Data collection included: age, height, weight, level of spinal cord injury, initial dose, titration schedule, present dose, concurrent medications for the treatment of pain, pain scores (present and prior to gabapentin initiation), adverse effects, serum creatinine or 24 hour creatinine clearance.

The evaluation and final results will be presented at the conference.

**Learning Objectives:**

Learn the pathophysiology of neuropathic pain following SCI.

Determine if gabapentin is effective for neuropathic pain following SCI.

**Self Assessment Questions:**

Gabapentin is FDA approved for neuropathic pain following spinal cord injury. T F

Gabapentin may be prescribed without monitoring renal function. T F

**EVALUATION OF CURRENT PRACTICE IN AND  
DEVELOPMENT OF PRACTICE GUIDELINES  
FOR TREATMENT OF SEVERE SEPSIS**

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**Background:** The mortality rates associated with severe sepsis in the United States range from 28 percent to 50 percent and have remained essentially unchanged for several decades.

Recently in the literature, new technology and optimization of current treatments have been shown to reduce this incidence.

**Purpose:** The objectives of this study were to: 1) validate the use of the International Classification of Diseases, Clinical Modification (ICD-9-CM) codes for estimating the incidence of severe sepsis (SS) at our institution, 2) determine the incidence and impact of SS on our institution's mortality rate, 3) evaluate our current treatment methods for SS and identify areas for improvement, and 4) develop a critical pathway for the care and treatment of patients with SS.

**Methods:** All inpatients from January 1, 2001- December 31, 2001 at the University of Illinois Medical Center at Chicago were retrospectively identified using ICD-9-CM codes for organ failure and infection. Data were collected on patient demographics, laboratory data, physical exam, vital signs, medications/treatments, other disease states, and patient disposition.

**Results:** Two hundred seventy patients were identified using ICD-9-CM codes. Other results and conclusions will be presented and discussed.

**Learning Objectives:**

Identify the type of patient who may benefit from use of activated protein C in the treatment of severe sepsis.

Describe the therapeutic targets of goal-directed therapy in sepsis.

**Self Assessment Questions:**

Certain ICD-9-CM codes can identify patients who have severe sepsis. T or F

Goal-directed therapy targets include: a) central venous pressure, b) mean arterial pressure, c) central venous oxygen saturation, d) hematocrit, e) all of the above.

## **PREVALENCE OF THE METABOLIC SYNDROME IN A VETERAN POPULATION**

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The metabolic syndrome is a cluster of metabolic risk factors that can occur in an individual. Patients with the metabolic syndrome are at increased risk of developing cardiovascular disease and have higher rates of mortality from cardiovascular diseases. The purpose of this study is to identify the prevalence of the metabolic syndrome in a veteran population.

A retrospective chart review of 495 unique patients with at least one ambulatory care visit in the VA Ann Arbor Healthcare System between September 2001 and August 2002 was conducted; demographics, vital signs, laboratory data, nutrition visits, and medication data were collected. To be identified as having the metabolic syndrome patients must meet at least three of the following criteria: triglycerides > 150 mg/dL; high-density lipoprotein (HDL) cholesterol <40 mg/dL for men or <50 mg/dL for women; fasting glucose > 110 mg/dL; blood pressure > 135/85 mmHg and/or body mass index (BMI) >30 kg/m<sup>2</sup>. These criteria were adapted from the World Health Organization and Adult Treatment Panel III definitions of the metabolic syndrome. In addition, medication therapy influencing any one of the above criteria was considered equivalent to meeting that criterion. Preliminary data analysis shows the overall prevalence of the metabolic syndrome to be 43% in our veteran population. Further evaluation of data to determine whether patients are at treatment goals based on the above criteria is planned.

The metabolic syndrome is a major risk for cardiovascular disease. In order to decrease this risk it is important to increase the awareness of healthcare professionals and work to provide optimal management of the syndrome.

### **Learning Objectives:**

To identify the current and varying definitions of the metabolic syndrome and its associated risks.

To evaluate the prevalence of the metabolic syndrome and its appropriate management.

### **Self Assessment Questions:**

The metabolic syndrome is a cluster of risk factors for cardiovascular disease. T or F

Pharmacologic and non-pharmacologic management of the metabolic syndrome criteria is adequate. T or F

## **RETROSPECTIVE ANALYSIS OF THE COMPARISON BETWEEN PHYSICIAN AND PHARMACY WARFARIN MONITORING IN A NURSING HOME SETTING**

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Previously, all nursing home patients at the Clement J. Zablocki Veterans Affairs Medical Center in Milwaukee, WI had warfarin monitored by physicians and nurse practitioners. In January 2001, pharmacy practice residents assumed responsibility for this monitoring. The purpose of this study is to determine whether there is a difference in outcomes when physicians and nurse practitioners monitor warfarin therapy compared to pharmacists. Determining any change in these outcomes will determine whether pharmacists have an impact on monitoring anticoagulation of inpatients. The outcomes to measure will be number of laboratory International Normalized Ratio (INR) draws, time within INR goal, number of warfarin dosage adjustments, administration of vitamin K and adverse effects defined as major bleeding episodes that resulted in admission to acute ward or death.

Eligible patients will be all patients admitted to Veterans Affairs nursing home being prescribed daily warfarin therapy for the purposes of treating pulmonary embolism (PE), Deep Vein Thrombosis (DVT), patients with Atrial fibrillation, patients with Cerebrovascular accidents or strokes, patients with heart valves, and those patients on lifelong warfarin therapy for other indications during their admission. Patients must be consecutively monitored for anticoagulation for twenty-eight days or more to be eligible to participate in the study. Patient will be excluded from the study if they are on other types of anticoagulation therapy other than warfarin, patients with medical contraindications to anticoagulation, and patients on nursing home unit for respite care (short term stay). The methods will be retrospective data collection using electronic chart before and after implementation of pharmacist monitoring. Data collection will consist of patient demographics (age and gender), progress note, pharmacy records and laboratory data review, and hospitalization records. A pharmacoeconomics analysis will be completed to determine potential cost avoidance or incurred based on results.

Results and conclusions will be presented at Great Lakes.

### **Learning Objectives:**

To learn whether pharmacists have an impact on monitoring anticoagulation of inpatients.

To review adverse effects associated with warfarin

### **Self Assessment Questions:**

Anticoagulation monitoring by pharmacists has been shown to be effective in the inpatient setting. T or F

Bleeding is one of the major adverse effects associated with warfarin therapy. T or F



## **DETERMINING THE INTERRELATIONSHIP BETWEEN ETHANOL KINETICS AND P-GLYCOPROTEIN ACTIVITY IN HUMANS**

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**Background:** People respond to the same amount of ingested alcohol very differently, which may be explained by diet, genetics, age, and sex. Exactly how and to what extent these factors affect alcohol absorption and elimination from the body are poorly understood. There is evidence to believe that alcohol, even present in small amounts in liquid medications, can affect the function of the gut and may affect the oral absorption of some medications.

**Purpose:** This research study is designed to investigate whether liquid vitamin E increases the oral absorption of ethanol via a p-glycoprotein mediated interaction.

**Methods:** Fifteen healthy men and 15 healthy women will be recruited to participate in this two-phase crossover research study with one half-day visit in each phase. Each phase will be separated by a washout period.

Subjects will be asked to fast before each study visit. Vital signs will be recorded at the beginning and end of each visit. Subjects will be randomized to receive either liquid vitamin E or water by mouth. They will then drink a sweetened alcohol-containing beverage over 10 minutes. Afterwards, they will blow into the mouthpiece of the breath alcohol detector to measure their breath alcohol concentration. This will be measured periodically throughout the remainder of the visit. For the second phase, each subject will receive the opposite treatment arm before receiving alcohol (i.e. if the received liquid vitamin E during visit one, they would receive water, and vice versa).

Subjects participating in the genetic testing component of this research will receive a one-time blood draw.

Results/Conclusion: pending

### **Learning Objectives:**

To enhance our understanding of ethanol absorption.

To determine whether there is a change in ethanol absorption after concomitant administration with liquid Vitamin E.

### **Self Assessment Questions:**

There is a drug interaction between ethanol and liquid vitamin E. T/F

Ethanol is a p-glycoprotein substrate. T/F

## **THE INVESTIGATION AND DEVELOPMENT OF A CREDENTIALING MODEL FOR AMBULATORY CARE PHARMACISTS**

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The investigation and development of a credentialing model for ambulatory care pharmacists practicing in various pharmacies and clinics throughout the Aurora Health Care -Metro Region will be described. Recently, interest in pharmacist credentialing has been growing due to their expanding roles as clinicians. Currently, Aurora Health Care has no model in place for credentialing ambulatory pharmacists. For years, the medical and nursing staffs have used a credentialing process in order to provide proof of competence for healthcare professionals. This process has been studied in order to evaluate what portions of the process might be extrapolated and used in a pharmacy specific model. Pharmacist credentialing processes at other organizations presently being used have been identified and investigated.

The development began with an explanation of the rationale for a credentialing model to the ambulatory care pharmacists. A credentialing workgroup, made up of these pharmacists, was formed in order to contribute to the development of a credentialing model. The model will be developed and initiated in specific ambulatory settings, such as anticoagulation clinics, to determine what improvements or adjustments need to be made. The ultimate goal is to apply this model to all of the ambulatory areas and, possibly in the future, to the inpatient pharmacists. This credentialing process will support pharmacists by validating their competence in the specialized roles they have developed. The documentation needed for credentialing could be used to combat any liability issues, as well as, provide the justification needed for reimbursement of cognitive services. If we are successful, other healthcare organizations may follow our lead in this endeavor.

### **Learning Objectives:**

Describe the benefits of a pharmacist credentialing process.

List the basic qualifications, defined by the credentialing model, of pharmacists who wish to expand their roles to practice in an ambulatory clinic.

### **Self Assessment Questions:**

At Aurora Health Care, pharmacists are typically credentialed by the:

- (a) medical staff
- (b) pharmacy department
- (c) nursing staff
- (d) none of the above

The development and implementation of a pharmacist credentialing model may help pharmacists gain provider status in the future.

True or False?

**PYLEONEPHRITIS AT AN URBAN MEDICAL CENTER  
EMERGENCY DEPARTMENT: PREVALENCE OF  
ANTIMICROBIAL RESISTANCE AND PROCESS OF CARE**

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Pyelonephritis is a common cause of Emergency Department (ED) visits, but few clinical studies of urinary tract infections have focused exclusively on pyelonephritis. The purpose of this study is to describe the incidence of pyelonephritis in patients discharged from the ED of an urban medical center by sociodemographic characteristics, presence of underlying chronic disease, and infecting organism.

This study will be conducted as a retrospective chart-review of all patients with an ED discharge diagnosis of pyelonephritis from January 1, 1998 through December 31, 1999.

Pyelonephritis will be defined as the presence of flank pain and/or tenderness accompanied by laboratory evidence of urinary tract infection. If flank pain and/or tenderness are absent, then the presence of signs/symptoms of systemic toxicity (along with laboratory evidence of urinary tract infection) will also be considered pyelonephritis. The incidence of pyelonephritis will be described by month, season, age, gender, racial/ethnic group, zip code of residence, presence of resistant organisms, presence of diabetes, other chronic diseases, human immunodeficiency virus infection, other immunocompromising conditions, known structural or functional abnormalities of the urinary tract, recent antibiotic use, recent hospitalization, or recent instrumentation of the urinary tract.

Data analysis will include the description of the incidence of pyelonephritis per 1000 patients by month of admission. We will also describe the proportion of all pyelonephritis patients with specific sociodemographic and medical characteristics. We will compare the distribution of specific sociodemographic and medical characteristics among pyelonephritis patients with E. coli pyelonephritis to non-E. coli pyelonephritis. In addition, we will compare the distribution of specific sociodemographic and medical characteristics among patients with E. coli pyelonephritis resistant to first-line antimicrobial agents to those in patients with pyelonephritis due to E. coli isolates susceptible to these agents.

**Learning Objectives:**

To review the epidemiology, diagnosis and treatment of pyelonephritis

To describe the incidence of pyelonephritis in patients discharged from an urban medical center by sociodemographic characteristics, underlying chronic disease, and infecting organism.

**Self Assessment Questions:**

Many studies of the clinical aspects of urinary tract infections have focused exclusively on pyelonephritis. T or F

Patients with recent antibiotic use may have an increased incidence of pyelonephritis caused by organisms resistant to first-line antibiotics. T or F

**DEVELOPMENT OF A PHARMACIST CLINICAL  
INTERVENTION PROGRAM UTILIZING A PERSONAL  
DIGITAL ASSISTANT**

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Documentation of pharmacists' interventions is increasingly important in the current healthcare environment. Documentation of these interventions is important to justify the role of the pharmacist in patient care. However, documentation can often be time consuming and generate significant paperwork. The purpose of this project was to determine if the use of personal digital assistants (PDAs) could improve the quantity and efficiency of pharmacists' clinical interventions. These parameters will be measured by generating reports quantifying interventions in various categories and by survey results.

Spectrum Health is an integrated health system with two main hospital campuses. The pharmacy department at each site utilized a different method for order entry and for collecting intervention data. In August 2002, Cerner PharmNet®, a new integrated pharmacy computer system, went live at both campuses and eliminated the previous documentation programs used at each site. PharmNet® has the ability to document pharmacist interventions, but the program is in development. Until completed, a simple and efficient method of collecting pharmacist interventions was desired. The PDA was chosen as a simple, efficient, and portable tool for documenting interventions. Pendragon® was selected as the documentation software. The program was designed based on previous documentation categories utilized. All possible intervention types were identified and then placed into six main categories. Prior to implementation, a survey assessed pharmacist's previous experience with documentation of interventions. Once designed, the program was trialed by the pharmacy residents and several clinical pharmacists. It was then loaded onto the remaining clinical pharmacists' PDAs. Program utilization was reviewed after a period of two months through a post-implementation survey and analysis of interventions. Numerous barriers to implementation were encountered and will be discussed. A future goal is to expand the use of the program to all pharmacists within the department and also to assess intervention quality.

**Learning Objectives:**

To determine if the use of PDAs can improve the quantity and efficiency of pharmacists' clinical interventions.

To identify potential barriers in the process of implementing the use of PDAs for clinical interventions.

**Self Assessment Questions:**

The PDA is a tool that can lead to improvement in documenting interventions. T or F

The Information and Technology (I&T) department can be a barrier to implementation. T or F

## **EVALUATION OF ERYTHROPOIETIN USE IN CRITICALLY ILL PATIENTS**

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Erythropoietin alfa is not FDA approved for treatment of anemia of critical illness. However, several studies have demonstrated safety and efficacy when used in this setting. The purposes of this study were: to develop and implement a protocol for erythropoietin use in the medical and surgical intensive care units (MICU and SICU), to collect data before and after protocol implementation, to use this data to assess the role of erythropoietin therapy in critically ill patients, and to assess compliance with the protocol.

The erythropoietin protocol was developed based on a review of current literature and was approved by multidisciplinary oversight groups in both the MICU and SICU. The primary components of the protocol were baseline iron studies, iron supplementation, standardized erythropoietin dosing, and consistent efficacy and safety monitoring.

Retrospective data was collected at baseline and after protocol implementation. Data collection was identical before and after implementation except that the post-protocol data included an assessment of compliance with the protocol. Both sets of data consisted of a convenience sample of 30 patients: 15 MICU and 15 SICU patients. Efficacy was assessed by cumulative packed red blood cell units transfused. Safety was assessed by the presence of adverse effects (hypertension, seizure, and thrombosis). Additional data collection included erythropoietin dosing regimen, iron studies, iron therapy, indication for erythropoietin, length of ICU stay, admission diagnosis, survival to discharge, and duration of intubation.

Preliminary baseline data suggests that pre-protocol administration of erythropoietin to critically ill patients was often not accompanied by iron studies or sufficient iron supplementation. In addition, there was little consistency in the doses chosen for treatment. After data collection and analysis are complete, the role of erythropoietin in critical illness will be assessed. If erythropoietin use is to be continued in the ICU, the protocol will be reevaluated based on our data.

### **Learning Objectives:**

Review the current literature on the use of erythropoietin in critically ill patients

Evaluate the safety and efficacy of the erythropoietin protocol for critically ill patients at The Ohio State University Medical Center

### **Self Assessment Questions:**

Adequate iron stores are needed in order for erythropoietin to be effective. T or F

The published literature studied erythropoietin administration during the entire ICU stay. T or F

## **DEVELOPMENT OF AN EYRTHROPOIETIN ALPHA USAGE GUIDELINE AND A MEDICATION USE EVALUATION FOR CANCER PATIENTS RECEIVING CHEMOTHERAPY AT THE UNIVERSITY HOSPITAL**

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Anemia is a frequent problem caused by myelosuppressive chemotherapy. This can lead to decreased quality of life and decreased daily functioning in this patient population. Severe anemia is often treated with blood transfusions, but mild-to-moderate anemia is often left untreated. Anemic cancer patients would benefit from proper initiation and monitoring of erythropoietin to help increase quality of life and improve daily activities. Improving anemia in cancer patients is becoming an important supportive care issue.

The purpose of this project is to establish a guideline for erythropoietin use in cancer patients receiving chemotherapy, to education physicians, medical residents, and pharmacists on the proper use and monitoring of erythropoietin in cancer patients, and to conduct an MUE to determine compliance with the guideline at The University Hospital (TUH).

Methods for this project included: 1) research and composition of a guideline for erythropoietin use in cancer patients receiving chemotherapy, 2) discussion of the proposed guideline with TUH oncologists/hematologists, 3) approval of the guideline from TUH Pharmacy & Therapeutics Committee, 4) education of pharmacists and hematology/oncology attendings and fellows, 5) creation of the MUE for cancer patients newly starting erythropoietin therapy and receiving chemotherapy at TUH and the Barrett Outpatient Cancer Center, 6) monitoring of MUE patients for 8 weeks for erythropoietin dosing changes and discontinuation, and 7) analysis of MUE data.

At this time, the guideline has been approved by the Pharmacy and Therapeutics Committee and implemented. Education has been provided to physicians and pharmacists. Nine patients have been identified to monitor with an MUE. Currently, seven MUE patients are being monitored with six of those patients being treated with erythropoietin for at least four weeks. One patient MUE is complete and one patient expired. Given the small number of patients and length of follow-up, preliminary conclusions are not available at this time.

### **Learning Objectives:**

Chemotherapy can cause anemia in cancer patients.

Quality-of-life can be increased in anemic cancer patients with proper initiation and monitoring of erythropoietin.

### **Self Assessment Questions:**

What are some of the benefits of initiation erythropoietin therapy in anemic cancer patients?

At what hemoglobin value have studies shown a benefit to initiating erythropoietin therapy in cancer patients?

## **METAMIZOLE EDUCATION INITIATIVE**

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Metamizole is a non-steroidal anti-inflammatory medication that was removed from the U.S. market by the FDA in 1979 secondary to its potential to cause agranulocytosis. Despite removal from the U.S. market, metamizole continues to be available in a variety of countries, including Mexico, and can be found in select Mexican supermarkets in the United States.

The purpose of this project is to determine the prevalence of St. Vincent Primary Care Center, Family Medicine, Spanish-speaking patients and/or their family member(s) who have taken a metamizole-containing product. A goal of this project is to provide Spanish-speaking patients with written and verbal education regarding the safety issues with metamizole, as well as safer alternative treatment recommendations. An additional goal is to provide metamizole information to other health care providers who may otherwise be uninformed that this problem exists.

All Spanish-speaking patients seen in the Family Medicine outpatient clinic during a predetermined 1 month period will be asked to participate in the study. Those patients who choose to participate will sign informed consent and complete a survey via a Spanish interpreter. The interpreter will present the findings to the primary care physician. If a patient has taken metamizole, appropriate monitoring will be completed. All patients who participate in the study will be educated regarding the potential dangers of taking a metamizole-containing product and will be provided with education on alternative medications that pose a less harmful side effect profile. A "The Dangers of Using Metamizole-containing Products" pamphlet will be distributed to all patients participating in the survey.

Study is to be implemented in Spring 2003. Results of this St. Vincent Research Committee- and IRB-approved study will be analyzed by the study team. Once prevalence has been determined, appropriate next steps will be established. These steps will be taken to enhance public and physician awareness.

### **Learning Objectives:**

State potential dangers of using a metamizole-containing product.

Identify patient populations at increased risk of ingesting metamizole.

### **Self Assessment Questions:**

What are the potential dangers of using a metamizole-containing product?

What patient populations are at increased risk of ingesting a metamizole-containing product?

## **LINEZOLID USE IN SURGERY PATIENTS: A FOCUS ON THROMBOCYTOPENIA INCIDENCE AND PREVENTION**

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**Purpose:** Linezolid is effective for vancomycin-resistant-enterococcus (VRE) and methicillin-resistant-staphylococcal (MRS) infections. This study was conducted to characterize linezolid use in surgical patients, identify thrombocytopenia incidence and the relationship between concurrent use of TPN containing pyridoxine and prevention of thrombocytopenia. A secondary goal was to identify costs associated with thrombocytopenia.

**Methods:** Patients receiving linezolid between 7/01-12/01 were identified. Data included: age, sex, indication, dose and duration of linezolid, platelet counts, concurrent medications known to cause thrombocytopenia (CMT) and use of TPN containing pyridoxine, vancomycin use, cultures, mortality and total hospital costs.

**Results:** 44 pt (25 males, age = 52 + 15 years) received 47 courses of linezolid: 20 vancomycin to linezolid for MRS or VRE, 19 linezolid for VRE, 3 vancomycin + linezolid for MRS, 2 linezolid to vancomycin for MRS. Mean dose and duration of linezolid was 1200mg/day for 8.9 days. Thrombocytopenia incidence was 19%, with mean platelet drops and times to nadir of 54% and 8.1 days. Thrombocytopenia occurred in 1/15 (6.67%) patients receiving TPN (8/15 received CMT) versus 8/32 (25%) who didn't receive TPN (1/32 received CMT) (p=0.23). Overall mortality was 18%, and mortality of those having a temporal relationship start of linezolid and the development of thrombocytopenia was 4/7 (57%). The average total hospital costs for patients with thrombocytopenia was 27% higher than patients without thrombocytopenia (\$114,645 versus \$89,622) (p=0.57).

**Conclusion:** - TPN with pyridoxine may decrease the risk and cost implications of thrombocytopenia associated with linezolid in surgical patients. The use of linezolid in surgery patients at our institution is appropriate based on VRE and MRS culture results.

### **Learning Objectives:**

To identify the potential risk of linezolid associated thrombocytopenia and its economic impact in surgery patients at a large academic medical center.

To document the potential benefit of TPN containing pyridoxine in surgery patients that have received linezolid.

### **Self Assessment Questions:**

The incidence of linezolid associated thrombocytopenia in surgery patients at The Ohio State University Medical Center is one percent. T or F

TPN containing pyridoxine may help prevent linezolid associated thrombocytopenia in surgery patients. T or F

## **DEVELOPMENT AND IMPLEMENTATION OF AN INTRAVENOUS INSULIN INFUSION PROTOCOL IN A UNIVERSITY BASED MEDICAL INTENSIVE CARE UNIT**

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Critically ill patients develop hyperglycemia for a number of reasons, even in the absence of a history of diabetes. Significant improvements in clinical outcomes have been shown using an intensive insulin regimen to maintain normoglycemia in critically ill patients. While studies have primarily focused on cardiothoracic patient populations, the value of such practices may be beneficial in the medically ill patients as well. In view of the current literature, we have developed a bedside intravenous insulin infusion protocol that will allow the nursing staff to adjust the insulin infusion rate based on current and prior glucose concentrations.

Critically ill adult patients (> 18 years old) admitted to the medical intensive care unit (MICU) at our institution under the primary care of the medical intensivist will be included. The protocol will exclude patients with a primary diagnosis of diabetic ketoacidosis or hyperosmolar non-ketotic states; those prescribed an oral diet; and those with an anticipated length of stay of less than 24 hours.

The nursing staff will titrate the intravenous insulin infusion to maintain a blood glucose concentration between 80 and 140 mg/dl based on protocol guidelines. As a process improvement measurement, data will be collected to assure the safety and efficacy of this protocol. The baseline data will include patient age, gender, height, weight, past medical history, medication history, and APACHE II score on admission to the MICU. Data that will be collected throughout the MICU admission will include daily capillary blood glucose (CBG) and the time in which it was obtained, ventilator status, concomitant medications, concomitant use of intravenous fluids, and nutritional supplementation. Data from previous patient populations requiring insulin administration will be compared to those patients where the intravenous insulin infusion protocol was utilized. Preliminary results will be presented.

### **Learning Objectives:**

Explain the clinical significance of an intensive insulin therapy in critically ill patients.

Identify limitations of an intensive insulin infusion protocol.

### **Self Assessment Questions:**

Critically ill patients who were treated with an intensive insulin therapy were shown to have a reduction of which of the following as described by Van den Berghe and colleagues?

- Mortality
- Multiple organ failure
- Duration of ventilatory support
- Blood transfusions
- All of the above

Which of the following patient-specific variables may cause variations in insulin requirements?

- Caloric intake
- Concomitant medications
- Severity and nature of the underlying illness
- Past medical history
- All of the above

## **IMPLEMENTATION OF DIRECT PHARMACEUTICAL CARE IN THE EMERGENCY DEPARTMENT**

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Northwestern Memorial Hospital (NMH) is a 720-bed academic medical center located in downtown Chicago. The Emergency Department (ED) is a Level I Trauma Center that treats approximately 180 patients per day. The NMH medical staff has been a strong proponent of pharmacist participation on multidisciplinary rounds in all other intensive care areas. The ED, however, has no direct interaction with the pharmacy staff except during cardiac arrests. The purposes of this study are to demonstrate that communications/relations between ED personnel and pharmacy staff, the process for ordering and delivering medications to the ED, pharmacy and therapeutic guideline adherence, and patient care and satisfaction can all be improved by having a pharmacist physically present in the ED.

Surveys of the ED personnel and pharmacy staff will be reviewed to identify areas in need of improvement. All medication requisitions that are sent to the pharmacy will be examined for completeness and accuracy. The pharmacy will keep a telephone assessment log of all communication with the ED both before and during the active phase of the study. After one month of ED requisition evaluation, clinical pharmacy services (drug information, discharge counseling, medication histories, adverse drug event consultations, medication inservices) and medication order entry will be provided by a dedicated ED pharmacist. All clinical interventions will be recorded, reviewed on a daily basis, and summarized in a final report. After incorporating the pharmacist as a member of the ED medical team for 3 months, the same satisfaction surveys will again be given to the ED and pharmacy staff to evaluate the impact the clinical pharmacist has had on patient care and employee relations. Based on our findings, we hope to develop a full-time pharmacy position in the ED.

### **Learning Objectives:**

Describe limitations to patient care a pharmacist may encounter by being stationed in a remote satellite pharmacy  
Describe situations that a pharmacist may be expected to resolve during a typical day in the ED.

### **Self Assessment Questions:**

Medication errors occur infrequently in the ED. T or F  
ED pharmacists must be proficient at multi-tasking to be an effective and efficient member of the medical team. T or F

## **PHARMACIST IMPACT ON SCREENING, DOCUMENTATION, AND ADMINISTRATION OF THE INFLUENZA VACCINE IN THE INPATIENT SETTING.**

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### **BACKGROUND**

The influenza virus is responsible for 114,000 hospitalizations and 20,000 deaths/year in the United States, mostly in the elderly who have an increased risk of complications, hospitalizations and death. The most recent CDC guidelines state, patients >50 years of age and/or with co-morbid conditions should be screened for vaccination during flu season. The goal is to have no missed opportunities for vaccination in this age group. The objective of this study was to promote immunization at our hospital through pharmacy involvement. With pharmacists on each unit, and through the provision of education it was hypothesized that the screening, vaccination, and documentation rate would increase.

### **METHODOLOGY**

Education regarding screening criteria and ordering process was provided to pharmacists, medical residents and attending physicians. Clinical nurse specialists were educated about the administration and documentation process and were responsible for relaying the information to their nursing staff. Unit clerks were instructed to include a pre-printed vaccine order form in each admission packet. Patients >50 years were identified daily. Data on those screened/immunized, and the level of appropriate documentation, was evaluated.

### **CONCLUSION**

Results and summary will be presented.

### **Learning Objectives:**

Identify the impact of pharmacist intervention on screening, administration, and documentation of the influenza vaccine.  
Recognize the importance of education when implementing provisions for process improvement and standards for improving patient outcomes.

### **Self Assessment Questions:**

Pharmacists can be involved in patient care by advocating immunization against the influenza virus. T or F  
Constant education and reinforcement is necessary for a significant impact on the screening and documentation rate of the influenza vaccine. T or F

## **ANGIOTENSIN CONVERTING ENZYME INHIBITORS AND BETA BLOCKERS: ARE PHYSICIANS PRESCRIBING ACCORDING TO CURRENT HEART FAILURE GUIDELINES?**

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Heart failure is a cardiovascular disease increasing in prevalence while other cardiovascular diseases are on the decline. It is associated with significant morbidity and mortality and is the leading discharge diagnosis in the Medicare population. Angiotensin converting enzyme inhibitors (ACEI) and beta-blockers (BBL) are essential medications for the optimal treatment of heart failure due to left ventricular systolic dysfunction.

The SOLVD and CONSENSUS trials demonstrated that ACEI increase survival and decrease hospitalization in heart failure patients. The MERIT-HF and PRECISE trials established that BBL when used with ACEI and diuretics also increase survival and decrease hospitalization. The contributions of these trials are incorporated into practice guidelines developed by the Heart Failure Society of America and the American College of Cardiology/American Heart Association Task Force.

The primary objective of this study is to assess whether ACEI and BBL are being prescribed in the Academic Internal Medicine (AIM) Clinic at St. Joseph Mercy Hospital Ann Arbor, Michigan as recommended by the current heart failure practice guidelines. The secondary objective will be to ascertain the possible barriers to prescribing ACEI and BBL as recommended by the guidelines.

A retrospective chart review of heart failure patients seen in the AIM clinic was performed. Patients were identified using the terms heart failure and cardiomyopathy from billing codes during September 2001 to September 2002. Patients' charts were excluded if they were < 18 years of age or if they did not have a diagnosis of heart failure, cardiomyopathy or if they were a prisoner. Information collected included patient demographics, medical history, pertinent medications, documentation of left ventricular ejection fraction, New York Heart Association Class, stage of heart failure, and documented reason for not prescribing ACEI or BBL.

Results are currently in progress and will be presented at Great Lakes Residency Conference.

### **Learning Objectives:**

Describe the role of ACEI and BBL in heart failure according to the current heart failure guidelines.

Explain barriers to prescribing ACEI and BBL in heart failure patients.

### **Self Assessment Questions:**

All patients with heart failure should be on both an ACEI and a BBL unless CI. T or F

A SCr greater than 2.5 is an absolute contraindication for an ACEI. T or F

## **IMPLEMENTATION OF PEGFILGRASTIM GUIDELINES IN AN ONCOLOGY ACUTE CARE AND CLINIC SETTING**

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Pegfilgrastim is the pegylated version of filgrastim indicated for reducing neutropenia in non-myeloid cancer patients receiving myelosuppressive chemotherapy. Current literature states that while a single dose is more convenient, pegfilgrastim is no more efficacious than filgrastim in reducing febrile neutropenia incidence and duration. A UWMC cost analysis indicates one dose of pegfilgrastim is equivalent in cost to nine doses of 480 mcg/day of filgrastim. In patients requiring fewer than nine doses of filgrastim at 480 mcg/day to achieve neutropenic control, pegfilgrastim use may not be economically appropriate. The UWMC developed guidelines to address these concerns and promote standardization of care that seeks to enhance safety and cost savings without compromising efficacy. This medication use evaluation aims to determine the guideline's impact on colony stimulating factor (CSF) use.

Guidelines were developed based on the American Society of Clinical Oncology recommendations for CSF use and incorporated pegfilgrastim information from published literature. The guidelines suggest that patients requiring a CSF after myelosuppressive chemotherapy should receive filgrastim after the first cycle. Pegfilgrastim use in future cycles is determined based on the number of filgrastim doses previously required. A review of 76 medical records involving oncology patients who received filgrastim (n=57), pegfilgrastim (n=16), or both (n=3) between November 2002 and February 2003 reveal some deviation from current practice guidelines. Data to be presented include demographics of CSF use, a cost analysis, and toxicity information.

Pegfilgrastim is a convenient but costly treatment; current studies have not found greater efficacy than filgrastim. Therefore, it is potentially wasteful to administer pegfilgrastim in patients who respond to daily injections of filgrastim totaling fewer than nine doses of 480 mcg/day. Out of 19 patients who used pegfilgrastim, two patients received filgrastim prior to pegfilgrastim initiation. Preliminary findings suggest appropriate pegfilgrastim use could be improved with more aggressive, prospective monitoring.

### **Learning Objectives:**

Describe the differences, advantages, and disadvantages between pegfilgrastim and filgrastim.

Explain the rationale for pegfilgrastim use guidelines and their potential benefits.

### **Self Assessment Questions:**

TRUE or FALSE? Pegfilgrastim is proven to be more efficacious than filgrastim in reducing the incidence and duration of febrile neutropenia.

TRUE or FALSE? It may not be appropriate to administer pegfilgrastim in patients who respond to lower doses of filgrastim after myelosuppressive chemotherapy

## **MEDICATION ERROR REDUCTION IN THE NEONATAL INTENSIVE CARE UNIT**

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The purpose of the project was to identify actual or potential medication errors in the Neonatal Intensive Care Unit (NICU) at two hospitals within the Aurora Health Care system and to implement interventions aimed at improving medication safety in the areas where errors were identified.

The current medication use process in the NICU was evaluated by several means. Incident reports for the previous 18 months were reviewed and trends in error type and medication involved were recorded. Personnel from the NICU were observed and interviewed to evaluate the safety of the present dispensing and administration practices. Comparison of the current practice with literature recommendations and the practice at two other hospitals in the Milwaukee area was also used to determine the standard of practice. Areas of concern were determined from the above methods and interventions to address them were designed and implemented.

Incident report review revealed that the most commonly reported error types were wrong administration time, infusion-related problems, and administration of a medication to the wrong patient. Drugs that were found to be involved most often were vancomycin, aminoglycosides, and lipid infusions. Comparison of procedures with the literature and other hospitals indicated that increased staff education, more double-checking of activities, and decreasing floor stock are areas where improvement can be made.

Multiple areas of actual or potential concern exist in the NICU. Interventions targeted at the common error types include increased medication administration record information, pharmacist infusion pump checks, and nurse/nurse double-checks of high-risk medications. Other interventions to better conform to the standard of practice are removal of potentially dangerous floor stock items, regular rotation of pharmacy staff through the NICU, and creating a patient specific dosing sheet for commonly used medications.

### **Learning Objectives:**

Identify three sources of medication errors that are unique to neonatal/pediatric patients

Recognize two ways in which pharmacists can improve medication safety in the NICU

### **Self Assessment Questions:**

True or False: Medication errors are more likely to occur in neonates than in adults

Which of the following are possible sources of medication errors in the NICU:

- A. Dilution of medications is often necessary for administration to neonates
- B. Dose calculations may involve multiple steps
- C. Patient parameters such as weight change rapidly
- D. All of the above

## **EVALUATION OF THE IMPACT OF A PHARMACY ANTICOAGULATION CLINIC IN A COMMUNITY HOSPITAL SETTING**

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Due to changing treatment standards for venous thromboembolic disease, an organized method for the management of anticoagulation for patients in an ambulatory care environment is required. The Outpatient Pharmacy Anticoagulation Clinic at the Saint Luke Hospitals, Health Alliance, is a pharmacist-directed clinic developed to meet the demands of physicians and patients to provide comprehensive and safe monitoring of anticoagulation.

The study is a prospective, observational, multi-center study evaluating patient outcomes and the potential impact of the services of a pharmacist-directed anticoagulation clinic in a community hospital setting. The primary objective is to estimate the impact on resource utilization in a community hospital setting and to develop an educational plan for physicians regarding the use of low molecular weight heparin in an ambulatory setting. The secondary objective is to provide a safe transition for patients requiring anticoagulation from the inpatient to an ambulatory setting and to determine patient satisfaction.

Patient demographics, length of stay, payor source, and discharge disposition were collected for all patients with the discharge diagnosis of DVT and PE for the eleven-month time period prior to the initiation of the anticoagulation clinic. Anticoagulation clinic charts will be reviewed for those patients referred to the clinic. Time within therapeutic range, bleeding complications, hospital admissions and emergency room visits related to anticoagulation will be determined.

174 patients were discharged with a diagnosis of DVT or PE. 71.3% of these patients were discharged to home. The average LOS was 7.6, 5.8, and 6.8 days respectively for patients with DVT/PE, DVT, and PE.

Based upon discharge disposition of those patients with DVT or PE, The Pharmacy Anticoagulation Clinic has the potential to greatly impact LOS. Optimization of an outpatient LMWH protocol and increased physician education regarding the use of these agents in the ambulatory setting will decrease unnecessary resource utilization.

### **Learning Objectives:**

To estimate the impact that low molecular weight heparin may have in an ambulatory setting.

To determine the effectiveness of the outpatient pharmacy anticoagulation clinic.

### **Self Assessment Questions:**

Can early LMWH utilization in DVT or PE have a potential to decrease overall LOS in patients diagnosed with DVT or PE? Y or N

What factors measured help determine the effectiveness of the pharmacy anticoagulation clinic?



## **MANAGEMENT OF COPD AND THE ROLE OF FLUTICASONE/SALMETEROL COMBINATION PRODUCT**

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Chronic Obstructive Pulmonary Disease (COPD) is defined as a chronic, irreversible, slowly progressive disorder characterized by airflow obstruction. Currently none of the existing treatments for COPD has been shown to prevent disease progression except for smoking cessation. The GOLD guidelines recommend inhaled beta-agonists as first line therapy. The use of inhaled corticosteroids is still controversial, although a recent published study, ISOLDE, showed that patients on inhaled corticosteroids had fewer exacerbations and slower decline in health status.

A new product, Advair(R), combines a long acting beta agonist, salmeterol 50mcg with fluticasone 100, 250, or 500mcg, a corticosteroid. This product is available as a dry powder inhaler (diskus), is breath-actuated, generates minimal airflow resistance and does not require special coordination of the traditional meter dose inhaler. The purpose of this study is to compare differences in end-points between patients using separate meter dose inhalers versus the Advair combination product.

Patients with COPD who are currently on both inhaled fluticasone 220mcg MDI and salmeterol MDI or Diskus twice daily will be randomized to continue on their current therapy or switch to the combination product containing salmeterol 50mcg with fluticasone either, 100mcg or 250mcg for a 12 month period. The primary end-point will be COPD exacerbations. Other end-points will be pulmonary function, health status, and health care costs.

RESULTS/CONCLUSIONS: Research in progress

### **Learning Objectives:**

Define current GOLD guidelines for the management of COPD.

Investigate the effect of inhaled corticosteroids administered as a combination product on clinical end points and health status.

### **Self Assessment Questions:**

What are the current GOLD guidelines for treating COPD?

What is the only treatment that has been shown to prevent disease progression for patients with COPD?

## **ACCURATE RESTOCKING OF AN AUTOMATED UNIT-BASED CABINET**

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The purpose of this study is to assess the types, contributing factors, and prevalence of errors in restocking an automated unit-based cabinet (UBC). Inaccurately restocking a UBC increases the potential for medication errors reaching the patient.

Aurora Health Care-Metro Region consists of 6 different hospitals with varying UBC restocking procedures. At each site, data was collected and reviewed for restocking errors from September 2002 to March 2003. Audits were conducted during the work week and weekends on the morning, evening and night shifts. Errors were categorized as the wrong drug, wrong strength, wrong dosage form, or expired drug. An error rate for each hospital was determined by dividing the number of errors by the number of restocked medications.

The UBC restocking procedures for the different hospitals were reviewed and compared in relationship to the error data. Contributing factors to UBC restocking errors were evaluated and system improvements for all sites will be implemented.

### **Learning Objectives:**

To evaluate the types and prevalence of errors in restocking an automated unit-based cabinet.

To analyze the contributing factors to inaccurate restocking of an automated unit-based cabinet.

### **Self Assessment Questions:**

Automated unit-based cabinets prevent restocking errors from occurring by identifying wrong drugs, wrong strengths, wrong dosage forms, and expired drugs. T or F

A pharmacist-check-tech system is more beneficial than a tech-check-tech system. T or F

## **TRENDS IN CANDIDA GLABRATA IN VITRO SUSCEPTIBILITIES TO ANTIFUNGAL AGENTS IN A TERTIARY CARE MEDICAL CENTER OVER 9-YEARS**

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Over the past 10 years, the incidence of primary blood stream infection (BSI) caused by *Candida* spp. has increased dramatically. Although *C. albicans* remains the most prevalent species of *Candida*, a trend towards increased percentages of non-*albicans* species has emerged. Trick and colleagues recently demonstrated a significant increase in the incidence of *Candida glabrata*, in particular, as the causative pathogen of fungemia. Of an even greater concern is the decreased antifungal susceptibility from some of these non-*albicans* species, such as *C. krusei* and *C. glabrata*. This observation may be due to the fact that certain non-*albicans* yeast may have higher intrinsic resistance to anti-fungal agents. The implication of our limited ability to treat some of these increasingly common infections has certainly generated interest as well as concern within the medical mycology community.

The purpose of this study is to characterize the susceptibility patterns of fungemia-causing *C. glabrata* isolated from a large tertiary care adult and pediatric medical center over 9-years. By correlating information regarding in vitro susceptibility data and the outcome of these cases, perhaps we can provide data concerning the potential for the future management of these fungal BSIs.

### **Learning Objectives:**

Understand the change in fungal epidemiology and its effects on patient management.

Understand the limitation of extrapolating in vitro data in the clinical setting.

### **Self Assessment Questions:**

How has the change in fungal epidemiology changed the empiric management of *Candida* bloodstream infections?

True or False. In vitro antifungal susceptibility is consistently correlated with clinical success.

## **MANAGEMENT OF DYSLIPIDEMIA IN VA PATIENTS WITH CORONARY HEART DISEASE (CHD) AND/OR CHD RISK EQUIVALENTS**

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The Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (known as Adult Treatment Panel III or ATP III) has new features from previous guidelines. Diabetic patients without coronary heart disease (CHD) have been elevated to the risk level of CHD risk equivalent. Additionally, these guidelines made key modifications of lipid and lipoprotein classification in patients with CHD or CHD risk equivalents. First, they identify LDL cholesterol < 100 mg/dL as optimal. Second, they raise the classification of low HDL cholesterol to < 40 mg/dL. Finally, they lower the triglyceride classification cutpoint of normal to < 150 mg/dL.

Despite the evidence showing reductions in morbidity and mortality with lowering of cholesterol, evidence suggests the majority of patients with CHD or CHD risk equivalents do not meet treatment goals defined by ATP III. Furthermore, few patients with hypercholesterolemia receive pharmacologic therapy.

### **PURPOSE:**

To determine if the risk of morbidity and mortality is being appropriately minimized in patients with CHD or CHD risk equivalents within the VA Chicago Health Care System based on ATP III guidelines.

### **METHODS:**

A report was run to identify all outpatients having International Classification of Diseases, 9th Revision (ICD-9) codes of Coronary Artery Disease, History of Myocardial Infarction, controlled/uncontrolled Type 1 and Type 2 Diabetes, Cerebral Vascular Disease, or Transient Ischemic Attack. A randomization table was used to select a sample of 200 patients from this population. For each randomized subject, identification of the diagnosis by ICD-9 code, identification of baseline lipid profile, liver function tests, creatine phosphokinase (as of 06/01/01, following publication of ATP III), assessment of most recent lipid profile, liver function tests, creatine phosphokinase, identification of patients receiving pharmacological treatment, and analysis of baseline and current lipid lowering treatment regimens was recorded.

### **Learning Objectives:**

Describe how ATP III recommendations differ from previous guidelines.

Discuss adherence to ATP III treatment guidelines in patients with CHD or CHD risk equivalents.

### **Self Assessment Questions:**

The ATP III recommendations for LDL cholesterol in a patient with diabetes is:

a) <160 mg/dL, b) < 130 mg/dL, c) < 100 mg/dL

According to ATP III, the non-HDL cholesterol goal in a patient with CHD or CHD risk equivalent is:

a) < 100 mg/dL, b) < 130 mg/dL, c) < 160 mg/dL

## **ASSESSMENT OF THE IMPACT OF PEGFILGRASTIM ON THE HEALTH ALLIANCE FORMULARY**

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A single dose of pegfilgrastim has been found to be comparable to daily dosing of filgrastim for up to 14 days in reducing the duration of neutropenia in patients receiving chemotherapy for non-myeloid malignancies. Few clinical predictive models exist to help determine which patients benefit from prophylaxis for neutropenia. The purpose of this study is to assess the appropriateness and duration of therapy with filgrastim in the prevention of neutropenia in patients receiving chemotherapy at The University Hospital and Barrett Cancer Center and to characterize risk factors associated with the need for filgrastim therapy. This data will be used to determine if pegfilgrastim would be appropriate and cost effective and to project the economic impact of the addition of pegfilgrastim to the formulary. The null hypothesis is there will be no difference between the cost of therapy with filgrastim versus pegfilgrastim in preventing neutropenia.

Patients receiving filgrastim after chemotherapy were identified and chart reviews were performed to determine duration and dose of filgrastim therapy, disease state, current/previous chemotherapy regimens, number of cycles received, demographics, concurrent/previous radiation, decrease in hemoglobin during the first cycle, baseline albumin, and pretreatment LDH.

Of the 195 patients identified, 28 (18 male, 10 female) qualified for this review. The mean age was 49.6 years (20-76). Twenty-eight patients (100%) received appropriate prophylactic therapy according to the ASCO Recommendations for the Use of Hematopoietic Colony-Stimulating Factors. However, three received inappropriate doses based on guidelines established at The University Hospital. The average duration of therapy (excluding one patient who received 20 doses) was 6.85 days (3-10). Further data analysis will be performed to determine if there is a correlation between patient variables and the need for prophylactic therapy and to compare the current cost of therapy with filgrastim with the cost associated with pegfilgrastim in the same population.

### **Learning Objectives:**

Explain the difference between primary and secondary prophylaxis for neutropenia.

Recognize the appropriateness of physician prescribing patterns for colony-stimulating factors for prevention of neutropenia.

### **Self Assessment Questions:**

What is the difference between primary and secondary prophylaxis with colony-stimulating factors for prevention of neutropenia?

The average duration of filgrastim therapy for the prevention of neutropenia is 11 days. T or F

## **IMPACT OF A LIPID MANAGEMENT SERVICE IN AN INTERNAL MEDICINE CLINIC**

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Effective management of hyperlipidemia can decrease cardiovascular morbidity and mortality. The purpose of this study was to evaluate the impact of a lipid management service in a medicine clinic. The objectives are to evaluate the percentage of patients at National Cholesterol Education Panel (NCEP) LDL goal, develop a lipid service, and compare the percentage of patients at LDL goal before and after development of the service.

This was a two-phase study. Clinic patients enrolled in a health maintenance organization with hyperlipidemia were included. Phase I was a chart review to identify patients not at LDL goal to be enrolled in phase II. Patients were excluded from phase II if they had not seen a physician twice or had more than two "no shows" in the last 12 months. A treatment algorithm was developed by pharmacists and approved by physicians to guide therapy in phase II. During phase II, pharmacists educated patients on lifestyle modifications and made therapeutic interventions. LDL was evaluated at enrollment, every six weeks until goal achieved, and at six months. At the study's conclusion, the percentage of patients at LDL goal in phase I and II will be compared.

Phase I evaluated 146 charts. Sixty-six patients (45.2%) were not at goal. Forty patients were excluded. Twenty-six patients were included in phase II. Baseline LDL ranged from 115-254 mg/dL (mean = 158.4 mg/dL) with six not calculable secondary to elevated triglycerides. To date, 15 patients were seen at a 6-week follow-up visit. The average absolute decrease in LDL was 38 mg/dL (20.8%). Five patients are now at LDL goal.

Preliminary data from phase II demonstrates that a lipid management service is beneficial. Phase two is ongoing and it is the researchers hope that a lipid management service will have a positive impact on cholesterol management in the clinic.

### **Learning Objectives:**

Understand the follow-up recommendations in the NCEP guidelines.

Recognize the major risk factors that modify LDL goals.

### **Self Assessment Questions:**

According to the NCEP guidelines, when a patient is initially started on a statin for elevated cholesterol/LDL, how long should the health care provider wait to have the patient's LDL rechecked? A) 6 months, B) 12 weeks, C) 6 weeks, or D) 2 weeks?

The LDL goal for a 60-year-old female that has a history of diabetes and hypertension is less than 130mg/dL. T or F

## **INCIDENCE OF VENTILATOR-ASSOCIATED PNEUMONIA IN PATIENTS TREATED WITH HISTAMINE 2-ANTAGONISTS VERSES PROTON-PUMP INHIBITORS**

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Ventilator-associated pneumonia (VAP) is a significant complication in intensive-care patients. Aspiration of bacteria in the oropharynx can occur due to compromised swallowing, leading to pneumonia.

Stress ulcers are another complication for ICU patients, and can lead to gastrointestinal bleeds. Maintaining a gastric pH above 3.5 may decrease the frequency of bleeding. Agents such as histamine 2 (H2)-antagonists are often used to prevent stress ulcers by raising the pH of the stomach. H2-antagonists have been associated with an increased rate of VAP over agents which do not alter gastric pH.

Proton-pump inhibitors (PPIs) are also used for stress-ulcer prophylaxis. In comparison to H2-antagonists, PPIs are superior at raising gastric pH. Despite this effect, there are no published studies which assess the incidence of VAP in patients treated with PPIs.

This retrospective reference-test cohort will compare the rates of VAP in 200 patients treated with H2-antagonists or PPIs for stress-ulcer prophylaxis. The occurrence of gastrointestinal bleeding and platelet count at initiation of acid suppression are secondary outcomes. Confounders to be assessed in VAP patients include history of COPD, immunosuppression, length of intubation, antibiotic use, presence of nasogastric tube, and enteral feedings.

### **Learning Objectives:**

To assess the relationship between gastric acid suppression and ventilator-associated pneumonia.

To understand the factors associated with increased risk of ventilator-associated pneumonia in intensive care patients.

### **Self Assessment Questions:**

H2-antagonists and proton-pump inhibitors are FDA-approved for stress ulcer prophylaxis. T or F

Pepsin is irreversibly inactivated at a pH > 6. T or F

## **DARBEPOETIN AND ERYTHROPOIETIN USE IN ANEMIC POST-RENAL TRANSPLANT PATIENTS**

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Anemia, defined as a hemoglobin consistently less than 11 g/dl, affects roughly 30% of the post-renal transplant population and can occur throughout the post-transplant period. Anemia in the late post-renal transplant period is a significant cause of patient morbidity and mortality, including cardiovascular diseases and diminished patient quality of life. Therefore, effective treatment of anemia in this population is essential.

The anemias associated with renal transplantation and chronic renal insufficiency share several similarities, including their pharmacologic treatment: erythropoietin (EPO). Several case reports and current clinical practices have demonstrated EPO's ability to combat post-renal transplant anemia. Unfortunately, some transplant recipients may fail to respond to erythropoietin, or may find the multitude of subcutaneous EPO injections distressing. Darbepoetin (Aranesp), a new long-acting erythropoiesis stimulating protein, was found to be as effective as EPO in increasing hemoglobin in patients with chronic renal insufficiency (CRI). Studies also demonstrate that patients with CRI-associated anemia can be effectively switched from EPO to darbepoetin without significant decreases in hemoglobin. Since various sources have established darbepoetin's efficacy in the treatment of CRI-associated anemia, we assert that darbepoetin can also be used effectively in the treatment of anemia following renal transplantation. We propose the following hypotheses: One, that darbepoetin and erythropoietin are at least equally efficacious in treating anemia during the post-renal transplant period and two, that darbepoetin is more effective in treating anemic post-renal transplant patients who are erythropoietin resistant.

A preliminary retrospective review will be conducted to identify renal transplant recipients who were, or are, being treated with darbepoetin or erythropoietin. Various parameters, including hemoglobins and iron saturations, will be evaluated to ascertain the effectiveness of these two erythropoiesis-stimulating proteins in categorized post-renal transplant populations (i.e. EPO-sensitive patients versus EPO-resistant patients). This preliminary data will hopefully serve as a foundation for a more extensive inquiry in the future.

### **Learning Objectives:**

Describe the impact of anemia on the post-renal transplant population.

Identify darbepoetin's potential therapeutic role in the treatment of post-renal transplant anemia.

### **Self Assessment Questions:**

Patients can have anemia following renal transplant, even if their grafts are functioning well. T or F

Darbepoetin can be dosed three times a week in patients with chronic renal insufficiency. T or F

## **PLANNING AND IMPLEMENTING A PHARMACY TEACHING CERTIFICATE PROGRAM**

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**Purpose:** To plan and implement a teaching certificate program involving didactic training and teaching opportunities to better educate local pharmacy residents and fellows to be more effective teachers.

**Methods:** The three parts of the program include seminar attendance, teaching experience, and the development of a teaching portfolio. An interest survey outlining possible seminar topics was distributed to Indianapolis pharmacy practice and specialty residents, and industry fellows. Ten seminar topics were finalized using interest survey results. Individuals to lead these seminars were then identified and scheduled. Objectives for each seminar were submitted to the American Council on Pharmaceutical Education (ACPE) for continuing education registration. For didactic instruction, participants had to attend at least eight of ten seminars. For practical application, participants had to deliver at least two presentations to audiences of at least 25 people and provide 15 hours of "other" instruction including facilitating group discussions, precepting, or mentoring. For documentation and reflection, participants had to create a teaching portfolio, which contained his/her teaching philosophy, teaching materials, and evaluations. Portfolios will be reviewed in June 2003 to provide feedback and assess completion of teaching requirement. After documented completion of all three requirements, the participant will be presented with a certificate of completion. **Results:** Participants completed evaluation forms at the end of each seminar. To evaluate knowledge gained, participants completed pre- and post-seminar tests. An overall program evaluation was distributed to assess the impact of the entire program. At the time of this abstract, five of ten seminars had received ACPE registration. In June 2003, feedback will be provided to participants regarding teaching portfolios. Preliminary results will be presented.

**Conclusion:** Planning a teaching certificate program for pharmacy residents and fellows is feasible with the appropriate resources. Acquiring ACPE registration for seminars may provide quality assurance that similar programs do not currently have.

### **Learning Objectives:**

Discuss the justification of need for a pharmacy teaching certificate program.

Discuss the implications of the participants' evaluations of the program.

### **Self Assessment Questions:**

The Indianapolis Pharmacy Teaching Certificate Program was offered to:

- A) local pharmacy practice residents from different programs
- B) local industry fellows (Lilly Visiting Scientists)
- C) local specialty residents from different programs
- D) all of the above

In order to obtain a certificate of completion, the participant will need to do which of the following between July 2002 and June 2003?

- A) attend 6/10 seminars, deliver 2 presentations, provide 15 hours of other instruction, and create a teaching portfolio
- B) attend 8/10 seminars, deliver 2 presentations, provide 15 hours of other instruction, and create a teaching portfolio
- C) attend 8/10 seminars, deliver 2 presentations, provide 5 hours of other instruction, and create a teaching portfolio
- D) attend 8/10 seminars, deliver 4 presentations, provide 15 hours of other instruction, and create a teaching portfolio

## **ORAPRED VS. PRELONE: A REDOSING STUDY**

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**STATEMENT OF PURPOSE:** Prednisolone has long been the corticosteroid of choice for a liquid formulation in the treatment of pediatric patients. A few years ago, Orapred came to market as a better tasting prednisolone formulation. There have been several studies comparing the palatability of the different formulations. However, there have not been any studies conducted to look at the overall cost effectiveness of the more palatable medication, Orapred. The AWP of Orapred is about 30% more than the AWP of Prelone.

**OBJECTIVE:** The objective of this study is to assess two factors. The first factor is the frequency of redosing in the pediatric population between Orapred and Prelone. The other assessment is the economic feasibility of having Orapred on formulary versus Prelone.

**STATEMENT OF METHODS:** This study is to be carried out in both the inpatient setting and the outpatient setting. Patients will be randomized to one of two treatment groups, Orapred Group and Prelone Group. Amber oral syringes will be utilized to maintain blindness of the person drawing up the medication and the patient receiving the medication. The administering nurse will fill out a Patient Monitoring Form that collects the data pertaining to patient's age, diagnosis for corticosteroid use, if the patient had to be redosed, and how many times they had to be redosed. A second set of information that will be collected on the patient monitoring forms is the number of inhaled beta2-agonist treatments the patient received before receiving the corticosteroid dose. For assessing adherence to the study protocol, the administering nurse will be asked to record how many milliliters were used per dose.

### **Learning Objectives:**

Based on palatability, state which medication is redosed least frequently in the pediatric population.

Based on redosing, state which medication is the most cost effective therapy to consider in formulary decision making.

### **Self Assessment Questions:**

Studies have shown Orapred to have better palatability over Prelone? T or F

When a medication has better palatability, but is more expensive, should that medication be on a hospital's formulary for regular use?

## IN VITRO SUSCEPTIBILITY OF PIPERACILLIN-RESISTANT AND PIPERACILLIN/TAZOBACTAM-SUSCEPTIBLE PSEUDOMONAS AERUGINOSA

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**Background:** At our institution in 2001, greater than 15% of *Pseudomonas aeruginosa* isolates were reported as resistant to piperacillin and susceptible to piperacillin/tazobactam. This discrepancy is greater than rates reported elsewhere. Although *P. aeruginosa* is known to have inducible AmpC beta-lactamases, beta-lactamase inhibitors have little effect. The greater activity of the combination would suggest a beta-lactamase is being produced that can be inactivated by tazobactam.

**Objective:** To determine if this phenomenon is due to potential subpopulations that may be producing a beta-lactamase that can be overcome by beta-lactamase inhibitors.

**Methods:** *P. aeruginosa* isolates were collected between September 2002 and January 2003. Isolates piperacillin-resistant and piperacillin/tazobactam-susceptible by Vitek were stocked in tryptic soy broth with 10% glycerol at -70°C until testing. Ten isolates that were susceptible to both agents and 10 that were resistant to both were also saved for use as controls. Thirty isolates were removed from stock that had previously been stored between 2000 and 2002. Isolates were tested against ticarcillin, piperacillin, clavulanate, tazobactam, sulbactam, and combinations of each beta-lactam with each inhibitor. Trays were supplied by Trek Diagnostics, Inc, Westlake, Ohio, USA.

**Results:** A total of 65 isolates of *P. aeruginosa* were collected and tested. Data will be analyzed to determine category changes and double dilution differences. Susceptibility results from Vitek and the trays will be compared. Results are pending.

### Learning Objectives:

To understand the NNCLS guidelines for reporting piperacillin susceptibilities for *Pseudomonas aeruginosa*

To describe the mechanisms of resistance of *P. aeruginosa* to antimicrobials

### Self Assessment Questions:

T/F-Piperacillin/tazobactam susceptibilities are recommended for routine testing and reporting by the NNCLS for *P. aeruginosa*.

T/F-*P. aeruginosa* has multiple resistance mechanisms.

## HEMODYNAMIC EFFECTS AND QUALITY OF PARALYZATION WITH CONTINUOUS INFUSIONS OF PANCURONIUM VERSUS CISATRACURIUM IN PATIENTS REQUIRING PROLONGED NEUROMUSCULAR BLOCKADE

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Pancuronium (PAN, a long-acting, renally eliminated, aminosteroidal agent) and cisatracurium (CIS, an intermediate-acting, benzylisoquinolinium agent with Hoffman elimination) are commonly used agents for prolonged neuromuscular blockade in the intensive care unit to improve oxygenation and tolerability of mechanical ventilation. PAN is recommended as a first-line agent by the Society of Critical Care Medicine and the American Society of Health-System Pharmacists guidelines; however, concern still exists over adverse hemodynamic effects secondary to its vagolytic properties. This study compared the hemodynamic effects [systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and heart rate (HR)] and secondary measures (train-of-four monitoring, dosages changes) of continuous infusions with PAN and CIS for sustained paralysis in the intensive care setting. Patients received an intravenous bolus followed by continuous infusions of PAN (0.04 to 0.1 mg/kg then 0.06 to 0.1 mg/kg/hr) or CIS (0.15 mg/kg bolus then 1 to 10 mcg/kg/min). Hemodynamic variables were prospectively collected at 60-, 45-, 30-, and 15-minutes pre-bolus and at 15-, 30-, 45-, and 60-minutes post-bolus. Assessment of hemodynamic differences between groups used the 1 hour pre- and post-bolus means. Sixty-two patients were needed to show significance of a 20% change in hemodynamics ( $p < 0.05$ ). Forty-five patients have been enrolled (13 PAN, 32 CIS). Preliminary pre- and post-1 hour hemodynamic variables are as follows: SBP [PAN: 110.89±21.72 mmHg and 116.48±18.17 mmHg ( $p=0.21$ ); CIS: 111.73±26.79 mmHg and 108.09±24.28 mmHg ( $p=0.62$ )], DBP [PAN: 63.97±10.95 mmHg and 67.20±13.69 mmHg ( $p=0.19$ ); CIS: 61.46±12.34 mmHg and 59.52±11.92 mmHg ( $p=0.53$ )], MAP [PAN: 78.08±14.26 mmHg and 82.92±14.64 mmHg ( $p=0.28$ ); CIS: 78.34±15.72 mmHg and 75.24±14.55 mmHg ( $p=0.39$ )], and HR [PAN: 108.98±19.91 bpm and 112.04±22.53 bpm ( $p=0.19$ ); CIS: 119.92±21.0 bpm and 114.36±21.51 bpm ( $p=0.15$ )]. Hemodynamic differences were not statistically different between the two groups. Updated results will be presented at Great Lakes Pharmacy Residency Conference.

### Learning Objectives:

Describe the pharmacology and adverse effects of neuromuscular blocking agents with critique of the differences between agents and their place in therapy.

Compare and contrast the effects of pancuronium and cisatracurium on systolic and diastolic blood pressure, mean arterial pressure, and heart rate.

### Self Assessment Questions:

Which of the following statements is true?

- Pancuronium has a quicker onset of action compared to cisatracurium.
- Pancuronium may cause an increase in heart rate due to its vagolytic properties.
- Cisatracurium has a longer duration of effect compared to pancuronium.
- Cisatracurium is primarily undergoes renal elimination.

Which of the following is NOT an indication for neuromuscular blockade?

- Inverse ratio ventilation
- Ventilator asynchrony
- Combativeness/agitation
- High peak airway or plateau pressures

**COMPARISON OF PANTOPRAZOLE VERSUS OMEPRAZOLE OR RANITIDINE IN CHILDREN REQUIRING ACID SUPPRESSION: A PROSPECTIVE THREE-ARM, PARALLEL GROUP STUDY**

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Purpose: Pantoprazole sodium, one of the newer proton pump inhibitors, is approved by the Food and Drug Administration for the short-term treatment of erosive esophagitis associated with gastroesophageal reflux disease, maintenance of healing of erosive esophagitis, and long term treatment of pathological hypersecretory conditions in adults. Several studies have measured the safety and efficacy of pantoprazole in this population, but currently there are no large randomized, double blind trials designed to evaluate the safety or efficacy of pantoprazole in children.

The primary objective of this study is to compare the safety and efficacy of pantoprazole versus omeprazole or ranitidine in pediatric patients. Secondary objectives include identifying primary indications for prescribing pantoprazole and to determine effective dosing parameters.

Methods: This prospective three-arm parallel study includes patients under the age of 18 with gastrostomy tubes on bolus feeds and currently receiving therapy with one of the study drugs. Patients with continuous 24 hour feeds or severe renal or hepatic disease were excluded. Patients were recruited from outpatient clinics and during inpatient hospitalization. Gastric pH was tested by investigator or caregiver once weekly for a four week study period.

Results: Data collection and analysis is currently ongoing. To date, 14 patients have been enrolled: 36% (5/14) in the ranitidine arm, 43% (6/14) in the omeprazole arm, and 21% (3/14) in the pantoprazole group.

Conclusion: Based on preliminary results, pantoprazole appears to be as safe and efficacious as ranitidine or omeprazole in pediatric patients requiring acid suppression. Further analysis will be presented.

**Learning Objectives:**

State the treatment options for pediatric gastroesophageal reflux.

List the usual dosage for pantoprazole in pediatric patients.

**Self Assessment Questions:**

What is the recommended dose of pantoprazole in pediatric patients?

Pantoprazole is the best acid suppressing agent in pediatric patients. True False

**DEVELOPMENT OF BEST BUSINESS PRACTICES FOR THE PROVISION OF CONSUMER MEDICAL INFORMATION**

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Consumers have an increasing desire to assume an active role in their own health care. As a result, consumer demand for medical information has increased. Although pharmaceutical companies are one source of medical information, the scope of information consumers receive from companies may be restricted due to a number of reasons. Pharmaceutical companies must avoid interfering with the health-care professional-patient relationship and may encounter legal/liability concerns. Regulatory agencies currently do not provide specific guidance to the pharmaceutical industry regarding responses to consumer medical information requests. Thus, information provided by pharmaceutical companies is variable within the United States and internationally. Specific objectives of this research project include (1) identifying current business practices for providing medical information to consumers by Eli Lilly and Company affiliates globally, (2) understanding international regulatory and legal requirements for providing consumer information, (3) determining affiliates' future vision for consumer medical information, and (4) developing a best business practice guide for answering consumer medical information requests.

A survey was distributed via e-mail to all Lilly affiliate Medical Information Associates (MIAs) to evaluate the provision of consumer medical information requests. Preliminary results are as follows: 68 individuals representing 55 countries completed the survey; 42 (51%) of the responding countries provide medical information to consumers. Thirty-five of 42 responders stated that £ 25% of all requests are from consumers. However, this volume still represents a high number of customer inquiries and is increasing yearly.

Due to the increasing volume of consumer requests, a complete understanding of the workload, scope of information, and guidance from regulatory authorities will be beneficial in determining how to proceed with providing consumer medical information. Survey results of the current global environment for providing medical information to consumers will also be presented and used to develop a guide for best business practices.

**Learning Objectives:**

To determine current strengths and methods, as well as, need or concerns of affiliates responding to consumer medical information requests.

To improve the process of responding to consumer medical information requests by sharing best practices among affiliates.

**Self Assessment Questions:**

The majority of affiliates report that consumer medical information requests account for £ 25% of total requests. T or F  
The majority of regulatory authorities provide non-specific guidance regarding consumer medical information requests. T or F



## **DEVELOPMENT OF A VENOUS THROMBOEMBOLISM RISK ASSESSMENT TOOL AND PHARMACOLOGICAL PROPHYLAXIS OPTIONS FOR SURGERY PATIENTS**

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Venous thromboembolism (VTE) is the most common cause of unexpected death in hospitalized patients and costs the U.S. healthcare system billions of dollars each year. There are 300,000 new deep vein thrombosis (DVT) cases per year, with the major complications of DVT affecting over two million Americans annually. Therefore, VTE prophylaxis to prevent DVT and pulmonary embolism has been targeted as a top safety priority for health care organizations. The purpose of this project is to develop a risk assessment tool enabling physicians to comprehensively evaluate the risk level of surgical patients and then provide them with guidelines for appropriate prophylaxis.

A multi-disciplinary VTE committee was formed to evaluate a standard patient screening method and specific prophylaxis options. The Thrombosis Risk Factor Assessment Form, which was developed at our institution based on the CHEST guidelines, was used as a tool to screen patients at risk for developing VTE. This form is used to determine the level of risk for a patient, as well as, provide appropriate prophylaxis recommendations. In this study, general and orthopedic surgery patients' charts were reviewed and baseline data were collected by completing a risk assessment form for each patient within 24 hours after surgery. Preliminary results indicate 80% of orthopedic and general surgery patients at ENH received appropriate prophylaxis.

The modified risk assessment form will be converted into an operational tool automatically presented to physicians when appropriate within the computerized physician order entry module of our clinical information system.

### **Learning Objectives:**

Identify appropriate pharmacological regimens used for venous thromboembolism prophylaxis according to CHEST guidelines.

List five risk factors that place patients at high risk for developing complications associated with not providing adequate prophylaxis.

### **Self Assessment Questions:**

The patients in the highest risk factor category hospitalized after surgery should receive pharmacologic prophylaxis with heparin, enoxaparin, or warfarin. T or F

Incorporating risk factor assessment tools for general use should improve compliance rates with venous thromboembolism prophylaxis. T or F

## **EVALUATION OF THE USE OF KILOGRAMS AS A STANDARD OF PRACTICE FOR THE DOCUMENTATION OF PATIENT WEIGHT**

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It is speculated that incorrect patient weight unit reporting is a common problem in hospital systems across the nation. Many medications are dosed based on unit per kilogram of weight. Reporting a weight in kilograms is an important technique that should be practiced by all health care professionals. More specifically, accurate patient weight in kilograms is necessary for the practice of pharmacy, and for the prevention of medication errors as a result of incorrect medication dosing. The resulting dose after calculation using an incorrect weight could be 2.2 times different from the necessary dose. It is strongly encouraged that patient weight is consistently updated in kilograms to maintain consistency with a patient's changing medication profile. Currently, there is no set standard in this health care region for the reporting of patient body weight. The data may be reported in several areas, creating a potential for error. The objective of this project is to increase the incidence of reporting patient body weight in kilograms in three specific patient documentation areas.

Pre-study data was gathered from three Metro region hospitals over one week via retrospective chart review of pre-specified areas within the patient chart. As suspected, the percentage of patient weight reported in kilograms was less than 45% of the charts reviewed. An addendum to the health system medication safety policy was created to include the metric system as the standard. Patient safety posters specifically related to this issue have been displayed. In addition, changes in the computer system creating a default to kilograms, and changing the patient weight scales to only read in kilograms will be utilized to accomplish the stated objective. Post-intervention data over one-week will be collected to assess the effectiveness of the interventions.

### **Learning Objectives:**

Describe the rationale behind the need to document patient weight using the metric system.

Describe and evaluate the intervention methods used to change this behavior.

### **Self Assessment Questions:**

T or F - Changing all scales within the region would create a more safe and efficient hospital practice.

At Aurora Health Care, prior to my project, weight was recorded in kilograms:

- 44% of the time
- 29% of the time
- 15% of the time
- 12% of the time

## **COMPLEMENTARY MEDICINE IN PAIN MANAGEMENT**

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Traditional medication regimens for pain management sometimes fail to reduce a patient's pain to an adequate level. Patients occasionally express interest in trying complementary and alternative therapies to help in controlling their pain, but access while in the hospital can be problematic. The purpose of this project is to create availability to complementary medicine for patients who are interested in using the therapies as an adjunct in pain control. A literature review on complementary therapies was completed to identify data available for therapies used in augmenting pain control. Nurses at Grant Medical Center attended a workshop on basic therapeutic touch for instruction on assessment and techniques used to administer an intervention. Guided imagery and relaxation aids were made available to the patients through visual and audio media. Some methodologies such as guided imagery, relaxation techniques and therapeutic touch have demonstrated a potential for improving pain control and coping methods. Complimentary therapy use at Grant Medical Center has been limited to date, however some patients have found the therapy useful in reducing the perceived level of pain.

### **Learning Objectives:**

Gain an understanding of complementary therapies used as adjuncts in pain management.

Identify methods of integrating complementary medicine in an institutional care setting.

### **Self Assessment Questions:**

Name one complementary therapy that can be used in managing pain.

What is a theory as to the physiological effects of relaxation in improving health and relieving pain?

## **THE EFFECT OF A PHARMACIST EDUCATIONAL INTERVENTION ON PATIENT KNOWLEDGE AND ATTITUDE REGARDING ANTIBIOTIC RESISTANCE AND APPROPRIATE USE IN ADULTS**

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The purpose is to: (1) Interactively educate patients regarding antibiotic resistance. (2) Assess the effect of a pharmacist educational intervention on patient knowledge and attitudes regarding antibiotic resistance and appropriate antibiotic prescribing. (3) Determine patient satisfaction with the pharmacist intervention. (4) Identify the role of pharmacists in antibiotic resistance education. This research includes adult patients presenting to a multidisciplinary urgent care clinic, November through February, identifying one or a combination of upper respiratory tract infection (URTI) symptoms from a chief complaint form (i.e., common cold, cough, earache, sinus problems, sore throat). Following completion of an initial survey assessing attitudes and knowledge about antibiotic resistance and prescribing, the survey is placed in a confidential location and the patient chart is flagged for intervention. Prior to being seen by a physician, each study participant receives an educational pamphlet created by The Centers for Disease Control and Prevention (CDC) and an educational intervention with a pharmacist. The educational encounter involves 1) a definition of antibiotic resistance, 2) an explanation of the risks associated with antibiotic resistance, 3) a description of the correlation between inappropriate prescribing of antibiotics and the emergence of antibiotic resistance, and 4) a review of conditions warranting use of antibiotics. Two weeks after the intervention, a post-intervention survey is sent to the patient. The post-intervention survey assesses changes in knowledge about antibiotic resistance and appropriate prescribing, and evaluates patient satisfaction with the intervention. Data collection began November 1, 2002. Greater than 100 patients have completed the baseline survey. The current response rate for the post-intervention survey is approximately thirty percent. We anticipate approximately 150 patients will complete the study by February 28, 2003. Conclusions will be drawn from pre- and post-intervention survey data.

### **Learning Objectives:**

Understand the value of patient education in the fight against antibiotic resistance and inappropriate prescribing.

Identify the role of the ambulatory/community care pharmacist in antibiotic resistance patient education.

### **Self Assessment Questions:**

Antibiotic resistance is a health care concern that primarily correlates to inappropriate I.V. antibiotic use. . True/False

Overprescribing of antibiotics:

- only occurs in urinary tract infection (UTI) treatment
- strongly relates to the emergence of antibiotic resistance
- reduces the recurrence of viral infections
- is a minor health care concern

## **PHARMACOGENOMICS AND ADVERSE DRUG REACTIONS IN CARDIOVASCULAR DRUG THERAPY**

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Adverse drug reactions (ADRs) are responsible for considerable morbidity and mortality. ADRs impair optimal patient therapy and may substantially increase healthcare costs. The challenge exists to identify patients at risk for experiencing ADRs and to modify their medications accordingly. Advances in pharmacogenomics present potential explanations for variable drug response by identifying genetic polymorphisms in metabolizing enzymes, drug transport proteins, and receptors. Certain cytochrome P450 (CYP) polymorphisms in CYP2C9 and CYP2D6 contribute to variable patient response to warfarin, beta-blockers, and antiarrhythmics. Likewise, genetic variation in p-glycoprotein may result in digoxin toxicity due to decreased drug efflux. Genotyping tests are currently available for some CYP enzymes, and while such testing is becoming more available, conclusive studies must be done to show cost effectiveness. The Drug Information Service (DIS) at the University of Michigan Health System (UMHS) has developed a database of ADRs detected through E-code analysis. By utilizing this database, this study purports to evaluate the role of pharmacogenomics in ADRs caused by cardiovascular medications. The study will consist of 3 comparison groups, each group containing 32 cardiovascular drugs: 1) Cardiovascular drugs associated with possible, probable, or definite ADRs (according to Naranjo score), 2) A random sample of all cardiovascular drugs as determined by AHFS classification, and 3) A random selection of cardiovascular agents (as determined by AHFS classification) in the top 200 selling drugs during the years of 1998-2001. The objective is to determine the proportion of drugs in each group that have genetically variable metabolism and/or transport. Our hypothesis is that a higher proportion of pharmacogenetically-variable drugs exists amongst those associated with ADRs than exists among other randomly selected groups of cardiovascular drugs. Results from this study will allow for estimation of preventable drug-induced ADRs and also for assessment of the clinical benefit of pharmacogenomics.

### **Learning Objectives:**

To evaluate the role of pharmacogenomics in adverse drug reactions (ADRs) caused by cardiovascular medications

To create a list of cardiovascular medications that are most often associated with ADRs and develop recommendations regarding the clinical use of such data

### **Self Assessment Questions:**

T or F: Pharmacogenetic variation in drug metabolism and/or transport may be responsible for the occurrence of some ADRs?

T or F: E-codes are a valuable source of information in the analysis of ADR data?

**RETROSPECTIVE ANALYSIS OF THE USE OF ENOXAPARIN AS BRIDGING THERAPY IN A VETERANS AFFAIRS MEDICAL CENTER**

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Many institutions utilize low molecular weight heparin as bridging therapy for chronically anticoagulated patients who are undergoing various procedures. Although published guidelines recommend the use of unfractionated heparin, studies have demonstrated that low molecular weight heparin is equally efficacious. Low molecular weight heparin also has the added benefit of more predictable results with less laboratory monitoring, allowing for home use rather than requiring hospitalization. The purpose of this study was to review the use of enoxaparin as bridging therapy in chronically anticoagulated patients at a Veterans Affairs Medical Center.

A computer generated list of patients prescribed enoxaparin from April 2000 to March 2002 was obtained. Patients who were prescribed enoxaparin, but who were either initiating warfarin therapy or who were not taking chronic warfarin therapy were excluded from the analysis. Data collected included patient demographics, warfarin indication, duration of warfarin therapy, department managing warfarin therapy, procedure performed, physician who prescribed enoxaparin, enoxaparin regimen ordered, time and dosage of warfarin restart, complications during bridging therapy, and documentation of bridging instructions.

The final analysis included 217 patients with an average age of 67.8 years ( $\pm$  9.5 years). A majority of the patients were male (98.2%). Ninety-seven (44.7%) of the patients were prescribed warfarin therapy for atrial fibrillation, while the second most common diagnosis was aortic or mitral valve replacement in 50 patients (23.0%). The most common procedures necessitating the need for bridging therapy were colonoscopy/esophagogastroduodenoscopy (28.1%). Analysis of the data revealed a lack of consistency in bridging regimens, dosing of enoxaparin, and warfarin restart regimens. The results also demonstrated a lack of documentation of the presence or absence of complications arising from bridging therapy. Results from this study will be utilized to develop a protocol for bridging therapy within the institution to improve the consistency of care given to this patient population.

**Learning Objectives:**

Learn the acceptable doses for enoxaparin therapy.  
List three side effects that may occur during bridging therapy.

**Self Assessment Questions:**

Patients who are taking warfarin due to a prosthetic valve do not need bridging therapy regardless of the procedure. T or F  
An acceptable dose of enoxaparin for an 88 kg patient is 100mg BID. T or F.

**PROTOCOL MANAGEMENT OF DEEP VEIN THROMBOSIS**

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The first lifetime occurrence of deep vein thrombosis (DVT) is diagnosed in more than 200,000 patients per year at a cost of \$1.5 billion dollars. Cost savings have been estimated at approximately \$2,750 per patient when treated with enoxaparin and warfarin at home versus unfractionated heparin and warfarin in the hospital. An outpatient protocol currently exists at St. Vincent, but is not widely used due to increasing experience and available literature. This has resulted in poor patient identification for inclusion, lack of patient education and discharge planning, and inadequate follow-up. The goal of this project is two-fold: 1) To update and revise the current protocol, and 2) Evaluate financial and clinical outcome data, for patients treated with the existing DVT protocol, to determine if patients with uncomplicated, proximal DVT can be discharged directly from the emergency department (ED).

The current protocol was revised for clarity, layout, and simplification of inclusion criteria attempting to increase compliance. Included in the revision, is the option to discharge patients with uncomplicated, proximal DVT directly from the emergency department. A mechanism to promote the protocol revision will be to provide education of physicians, nurses, and discharge planners. In presenting the updates, we will also provide both financial and clinical data surrounding the outpatient management of DVT.

Financial data analysis is currently underway to evaluate institutional costs of DVT patients treated with an inpatient or 23-hour observation status in 2001, and to compare the costs of treatment in the ED. This data will determine if a financial benefit exists to discharge patients directly from the ED. Patient factors to consider include outpatient medication and monitoring costs, and quality of life. Implementation of an updated protocol and education regarding the outpatient management of DVT will be presented in the Spring 2003 with continued evaluation of the protocol.

**Learning Objectives:**

Identify patients who may qualify for outpatient treatment of DVT  
Identify the relevant costs in performing a pharmacoeconomic analysis

**Self Assessment Questions:**

Patients with a recent bleeding episode within the past two weeks are not candidates for inclusion in the DVT outpatient treatment protocol.  
A. True  
B. False  
When considering institutional costs in a pharmacoeconomic analysis of outpatient treatment of DVT, medication costs do not need to be considered.  
A. True  
B. False

## **ERRORS ASSOCIATED WITH THE INSULIN USE PROCESS**

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Insulin administration is a complex process in which there are many areas for errors to occur. An Institute of Safe Medication Practice report reveals 11% of serious medication errors are related to insulin misadministration. Aurora Health Care (AHC) maintains a voluntary error reporting system. Using this data, the current estimate for AHC is that 80% of reported insulin errors are administration errors. The object of this study is to examine the insulin use process and detect factors that lead to potential and actual insulin administration events and errors. Various aspects of the insulin use process were examined: insulin storage, written physician orders, pharmacy order entry and transcription, and documentation of capillary blood glucose, and documentation of administered insulin doses. Data collection was via chart review, direct observation, and reports from the voluntary error reporting system. Data was collected from three hospitals. Documentation was located in three different locations; 27% of the time it was documented in two locations. Storage of insulin was not standardized between different units or hospitals. Although available, preprinted insulin order sets were not used. Interventions focus on the following: 1) all insulin orders on the MAR will appear together on the printed MAR, 2) create an order entry function for blood glucose checks, to likewise appear and be documented on the MAR, 3) improve pharmacy order entry and thus the appearance of the directions on the MAR, and 4) update preprinted insulin orders to decrease prescribing and transcription errors.

### **Learning Objectives:**

Heighten awareness of the risks associated with documentation of capillary glucose levels and administered insulin doses in multiple areas.

Understand the multidisciplinary approach to addressing medication safety and errors.

### **Self Assessment Questions:**

Insulin Medication Errors have the potential to occur in several steps along the medication administration process.

Multiple areas of documentation is a medication error reduction strategy.

## **RESPONSE TO RITUXIMAB AND ICE OR ESHAP CHEMOTHERAPY REGIMENS IN PATIENTS WITH NHL**

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Rituximab is indicated for the treatment of patients with relapsed or refractory low-grade or follicular, CD20 positive, B-cell non-Hodgkin's lymphoma. Rituximab use at our institution has increased 58.5% over one fiscal year (1999-2000) and is currently our most costly drug expenditure.

The goal of the study was to assess the outcome of combining rituximab with salvage chemotherapy. Objectives were: 1) evaluate the response to rituximab when given with ICE (ifosfamide, carboplatin, and etoposide) or ESHAP (etoposide, methylprednisolone sodium succinate, cytarabine, and cisplatin) chemotherapy; 2) determine the frequency of readmissions due to neutropenic fever, and; 3) evaluate response to stem cell transplant in patients who received rituximab.

The computerized charts of inpatients and outpatients who received ICE or ESHAP chemotherapy with or without rituximab over the last year (8/1/01-7/31/02) were reviewed. The results of those who received rituximab were compared to those who did not receive rituximab and also to results from published studies of patients who received ICE or ESHAP chemotherapies only.

Rituximab was given in combination with ICE or ESHAP to 12 and 14 patients, respectively. Rituximab plus ICE yielded an overall response rate of 25% compared to literature results of 63.6% for ICE alone. Rituximab plus ESHAP yielded an overall response rate of 28.6% compared to literature results of 47.5% for ESHAP alone. Results from James Cancer Hospital patients receiving ICE or ESHAP only are in progress. Preliminary findings show the addition of rituximab to ICE or ESHAP chemotherapies does not result in greater overall response rate when compared to the results obtained through published clinical studies. Also, no increased risk of neutropenic fever was observed with the addition of rituximab. Lastly, due to the low number of patients advancing to stem cell transplant, no conclusion can be made at this time.

### **Learning Objectives:**

Explain the advantages and disadvantages for adding rituximab to chemotherapy.

Identify which subsets of NHL may benefit from the addition of rituximab to chemotherapy.

### **Self Assessment Questions:**

Neutropenic fever is a common and expected adverse effect of rituximab. T or F

Non-Hodgkin's lymphoma patients who fail salvage chemotherapy are ideal candidates to receive an autologous bone marrow transplant. T or F

## **ANALYSIS OF THE PHARMACY RESIDENT SEMINAR EVALUATION PROCESS**

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**BACKGROUND:** As health care professionals, pharmacists are expected to be proficient in communicating with and educating patients and other health care providers. Continuing education seminar is a major component of completion of our pharmacy practice residency program. Evaluation of presentation skills is an important process of validating resident educational progress and overall effectiveness in educating others. However, standardized methods for evaluation have not been established for pharmacy practice resident presentations. At the University of Illinois the pharmacy practice residents' seminars are evaluated with internal and required continuing education evaluation forms.

**METHODS:** Internal and continuing education evaluation forms were reviewed and analyzed for the past two years of pharmacy resident seminars at the University of Illinois Medical Center at Chicago.

**RESULTS/CONCLUSIONS:** Data analysis is ongoing. Results will be presented at the conference.

### **Learning Objectives:**

To identify the importance of a structured evaluation process and analyze the current practices of evaluation involving pharmacy resident seminar.

To determine if there is consistency among evaluators of seminar and the different evaluation forms used.

### **Self Assessment Questions:**

Evaluation techniques are widely varied and lead to inconsistencies. T F

Proper methods for evaluations need to be established. T F

## **A SURVEY OF ACID SUPPRESSION PRESCRIBING PRACTICES FOLLOWING UPPER GASTROINTESTINAL BLEEDING (GIB)**

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Acid suppressive therapy is an important adjunct in the management of upper GIB. Although recent evidence suggests that intravenous (IV) proton pump inhibitors (PPI) may be more effective than IV histamine-2-receptor antagonists (H2RA) in preventing gastrointestinal rebleeding events, controversy exists regarding which subgroups of patients will derive the most benefit from IV PPI therapy, the optimal dosing regimen for IV PPI therapy and the role of enteral PPI therapy. The purpose of this study was to evaluate acid suppression prescribing practices following upper GIB in the state of Michigan.

A one-page survey was developed consisting of questions related to current institutional prescribing practices for acid suppression. Reliability and validity of the survey was established by having three experienced pharmacists pretest the form. Surveys were mailed to the director of pharmacy at all hospitals in the state of Michigan. The same survey was mailed a second time, one month later.

To date, 40/271 (15%) hospitals have responded. Most institutions 23/40 (58%) were <200 beds. The majority of hospitals 27/39 (69%) had one preferred IV acid suppressive agent for acute GIB therapy with 18/27 (67%) using a H2RA and 9/27 (33%) using a PPI. Few sites 9/31 (29%) reported the use of a continuous infusion dosing regimen when an IV PPI was prescribed. While only 7/40 (18%) hospitals had institutional guidelines, 26/39 (67%) had restrictions for the use of an IV PPI. Most practitioners 31/40 (78%) selected a PPI (tablet/capsule) as oral step-down therapy; few 6/40 (15%) used a PPI suspension.

In conclusion, there is a wide divergence in acid suppression prescribing practices following upper GIB in the state of Michigan. The preferred agent for acute acid suppression is an IV H2RA, while a PPI is preferred for oral step-down therapy. Few centers administer PPI by continuous infusion or utilize oral suspensions.

### **Learning Objectives:**

To evaluate the therapeutic regimen of choice for acute acid suppression in patients following an upper GIB in the state of Michigan.

To evaluate the therapeutic regimens used for oral step-down therapy in patients following an upper GIB in the state of Michigan.

### **Self Assessment Questions:**

In Michigan, there is wide divergence in prescribing practices following upper GIB. True or False

The preferred agent for acute acid suppression following an upper GIB at most hospitals in the state of Michigan is an IV PPI. True or False

**INCIDENCE OF CARBAPENEM-ASSOCIATED  
HYPERSENSITIVITY REACTIONS AMONG PENICILLIN  
ALLERGIC PATIENTS VERSUS PATIENTS WITHOUT A  
PENICILLIN ALLERGY**

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Purpose: This study investigates the incidence of cross-hypersensitivity reactions between penicillin and carbapenem antibiotics in penicillin allergic patients versus patients not allergic to penicillin. Since skin testing is performed only in isolated situations, it is often the allergy information provided by the patient and patient's medical record that guide the practitioner's choice of antibiotic therapy. The purpose of this study is to provide data that would allow practitioners to make more informed decisions about choosing an antibiotic in patients who report a history of allergy to penicillin. Methods: Our study design is a controlled retrospective analysis including 270 patients. Patients have been assigned to either the penicillin allergic group (group A) or the non-penicillin allergic control group (group B) in a 1:1 ratio. Each group has been further subdivided in a 1:1 ratio into patients treated either with imipenem or meropenem. Preliminary results: This study is currently in process. Thus, data at the time of abstract submission is inadequate for presentation. It is hypothesized that patients with a documented or reported penicillin allergy will demonstrate a 10 percent cross-hypersensitivity rate when treated with a carbapenem, and patients without a penicillin allergy will demonstrate approximately a 1 percent cross-reaction rate. It is also hypothesized that there will be a similar cross-allergenicity between the two carbapenems; and, that an equivalent hypersensitivity rate among all carbapenem treated patients will be noted. Preliminary Conclusions: Patients with a reported history of penicillin allergy will demonstrate an increase risk for cross-hypersensitivity when treated with a carbapenem antibiotic compared with patients with no reported penicillin allergy. This increase in cross-allergenicity is expected to be similar between imipenem and meropenem.

**Learning Objectives:**

Identify the true risk for cross-allergenicity associated with carbapenem antibiotic treatment among patients with documented / reported penicillin allergy to allow practitioners to make more informed decisions regarding the choice of antibiotics in patients who report a history of allergy to penicillin antibiotics.

If a difference exists, determine the carbapenem with the most favorable cross-hypersensitivity profile.

**Self Assessment Questions:**

When treated with a carbapenem antibiotic, the risk for cross-hypersensitivity reactions is higher among patients reporting a penicillin allergy compared with patients not allergic to penicillin. (T/F)

The comparative incidence of cross-hypersensitivity reactions between imipenem and meropenem in patients reporting a penicillin allergy is equivocal. (T/F)

**IMPACT OF A CLINICAL PHARMACIST ON HEART FAILURE  
PATIENTS**

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Approximately 500,000 patients are diagnosed with heart failure each year. Heart failure accounts for 12-15 million office visits and 6.5 million hospital days annually. Medication noncompliance has been shown to be an important determinant of hospitalizations among heart failure patients. Pharmacist intervention has been shown to lower all-cause mortality and heart failure events among heart failure patients.

The purpose of this study is to measure medication compliance among patients enrolled in the Clarian Health Heart Failure Clinic before and after counseling from a clinical pharmacist. The study utilizes the Beliefs about Medication Compliance Scale (BMCS) to measure the patient's perception of their medication use, compliance, and satisfaction with their medications. The BMCS consists of 12 questions, 6 to measure compliance and 6 to measure barriers to compliance. Eight additional questions with a primary focus on pharmacy related issues are also being used.

After administering the scale, the pharmacist will educate the patient about their medications and address any perceived barriers to compliance. The pharmacist will also review the patient's list of medications for those contraindicated in heart failure and make recommendations to the cardiologist. The scale will then be readministered at 2 months to measure for a difference in scores. The pharmacist will conduct telephone calls to participating patients at 2 and 6 weeks to address any questions or concerns regarding their medications.

**Learning Objectives:**

Discuss the need for a pharmacist in a heart failure clinic.  
Discuss common perceived barriers to compliance.

**Self Assessment Questions:**

The pharmacists' involvement in specialized clinics has decreased. T F

According to recent studies, barriers to compliance with diuretic therapy include restrictions of activities outside of the home and embarrassment. T F

## **PROSPECTIVE STUDY EVALUATING THE USE OF ENOXAPARIN IN RENAL IMPAIRMENT**

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Enoxaparin is a widely used anticoagulant indicated in the prevention and treatment of deep vein thrombosis, prevention of thromboembolism with knee surgery, stabilization of unstable angina and non-Q wave myocardial infarctions. Enoxaparin is removed from the body through the kidneys. There are limited data on enoxaparin dosing in renal impairment. Despite the evidence suggesting that the anticoagulant effect of enoxaparin increases in renally impaired patients, enoxaparin is commonly prescribed in this patient population. The rationale for this study was to assess the current dosing practices of enoxaparin at St. Margaret Mercy Healthcare Centers with the intent to determine a safe and effective dose reduction for this patient population.

A medication usage evaluation was developed and patient charts were reviewed prospectively based on medication usage parameters. The medication usage evaluation identified the following criteria: patient demographics, indication for enoxaparin, renal function, enoxaparin dosing regimen, number of days treated, dose adjustment percentage, laboratory monitoring, radiologic testing, bleeding & thromboembolic events, and patient progress followed bi-weekly until discharged. Patients were initially screened based on their renal function. Patients with serum creatinine > 1.5 were included in the study.

Preliminary results illustrate that physicians are making a wide range of dose reductions for renal impaired patients. Final results are pending completion of more data collection.

### **Learning Objectives:**

Identify the problem with dosing enoxaparin in renally impaired patients.

Discuss the outcome of current dosing practices in renally impaired patients.

### **Self Assessment Questions:**

Enoxaparin can be used in renal failure patients without any complication. T or F

Recently, the manufacturer of enoxaparin published specific dosing guidelines for patients with renal impairment. T or F



## **DOSE ROUNDING GUIDELINE DEVELOPMENT FOR DALTEPARIN IN ACUTE CORONARY SYNDROME**

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Low molecular weight heparins (LMWH) have become standard therapy for treatment of acute coronary syndromes (ACS) and prevention of associated morbidity and mortality. Appropriate dosing of LMWH's on a per kilogram basis has been published in the literature, although variation exists regarding acceptable rounding of doses. Prescribed doses are typically selected based upon availability of pre-made dosage forms for the various agents. Enoxaparin (Lovenox) is available in numerous pre-made syringe sizes, but dalteparin (Fragmin) has fewer available pre-made syringe sizes, making weight-based dose selection more difficult. The purpose of this guideline development is to assist in the standardization of LMWH dosing in ACS at our institution.

The formulary choice at the UWHC for LMWH is dalteparin. A therapeutic interchange is approved for conversion of enoxaparin to dalteparin for all indications. Based upon current published literature and information obtained from other institutions, guidelines were developed and will be implemented for dalteparin dose rounding.

A baseline drug use evaluation is being conducted to assess the previous dose rounding by pharmacists. Data to be collected include gender, age, weight, serum creatinine, dalteparin dose ordered, actual dose used and the cost per syringe. The results of this study will be presented.

### **Learning Objectives:**

To identify current dosing strategies for LMWH in ACS.

To describe the impact of a dose rounding guideline in terms of cost savings and convenience.

### **Self Assessment Questions:**

How many pre-made syringe sizes are available for dalteparin?

What is the appropriate dose of dalteparin (per kg) in ACS?

## **DIFFERENCES IN P-GLYCOPROTEIN EXPRESSION BETWEEN ADOLESCENTS AND ADULTS**

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P-glycoprotein (PGP) is a multi-drug efflux pump expressed throughout the body, including on the surface of various lymphocytes. Although its role in lymphocytes is unclear, existing data suggest that lymphocyte p-glycoprotein is involved in determining lymphocyte responsiveness to drugs such as glucocorticoids and cyclosporine.

This is a prospective observational study, designed to answer important questions regarding the relationship between age and PGP content and mRNA expression. The recruitment of subjects will begin as soon as the lab analysis methods are validated.

A total of 48 healthy volunteers will be enrolled, consisting of 24 adolescents (10-20 years of age) and 24 adults (>20 years of age). The study will consist of three visits, spaced two weeks apart. Following a screening history and physical examination to determine eligibility, subjects will be enrolled. At each visit all subjects will have one venous blood sample obtained. Lymphocytes will then be isolated using density gradient centrifugation, and protein and mRNA will be isolated for analysis. Semi-quantitative rt-PCR and Western immunoblotting will be used to determine PGP content and expression. The recruitment of subjects will begin as soon as the lab analysis methods are validated.

Lab method validation is in its last stage. We expect to be enrolling subjects in the beginning of March and have preliminary results by the end of April.

### **Learning Objectives:**

To describe the physiologic functions of PGP as a cellular component and discuss issues relating PGP to drug absorption and causes of variability.

To describe the study design which will aim to compare the amounts of PGP mRNA and PGP content within circulating lymphocytes in a group of healthy adolescent subjects to corresponding amounts of the same variables in adults.

### **Self Assessment Questions:**

There is likelihood that the amount of PGP mRNA expression and PGP content within circulating lymphocytes differs between adults and adolescents. True or False

Some sex steroids can alter the activity of PGP. True or False

## **DRUG USAGE PATTERNS OF INTRAVENOUS PANTOPRAZOLE BEFORE AND AFTER IMPLEMENTATION OF PRESCRIBING CRITERIA**

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**Purpose:** To develop prescribing criteria for intravenous pantoprazole and to measure its effect on drug utilization.

**Methods:** Prospective chart reviews were completed of patients prescribed intravenous pantoprazole during the months of July-August 2002. Preliminary results were organized into a medication utilization analysis (MUE), which demonstrated an increased utilization trend for this non-formulary medication. Data collected indicated the medication was being utilized to treat the non-FDA approved indication of gastrointestinal bleeding, often at the incorrect dose and length of therapy. Results of this analysis were presented to the organization's critical care drug specialty panel (a subcommittee of the health system Pharmacy & Therapeutics Committee) with recommendations for formulary addition with strict criteria for use. The system leadership council approved these recommendations in September 2002. Formal implementation of criteria began in February 2003, after a "phase in" transitional period and pharmacist and prescriber education of the new criteria. Data is being collected to determine impact of these criteria on utilization and patient selection. Physician adherence to criteria and pharmacist impact on prescribing, as well as the potential cost savings, will be measured as endpoints. Literature will be reviewed in six months to determine the need to adjust criteria.

**Results:** Development and implementation of criteria has been completed. Data collection on effectiveness of criteria will be completed in March.

**Conclusions:** Prescribing criteria are a tool for limiting utilization of a costly medication with limited evidence based support in the treatment of gastrointestinal bleeding. Such criteria can affect prescribing patterns and utilization.

### **Learning Objectives:**

To describe the steps necessary to develop and implement prescribing criteria for intravenous pantoprazole, a high cost medication with limited literature supporting its impact on mortality in the treatment of gastrointestinal bleeds.

To describe the financial and therapeutic impact of prescribing criteria for intravenous pantoprazole at a community teaching institution.

### **Self Assessment Questions:**

What methods are used for developing prescribing criteria for a medication?

What factors influence which medications are chosen for prescribing criteria?

## **IMPLEMENTATION OF BISPECTRAL INDEX MONITORING IN THE PEDIATRIC INTENSIVE CARE UNIT**

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Adequate sedation is an essential factor for patients in the pediatric intensive care unit (PICU). Several of the sedation evaluation tools have been validated in the literature, but these tools are not effective in the assessment of paralyzed patients. BIS monitors could provide an objective assessment of the patient in addition to clinical assessment. The purpose of this project was to implement the use of Bispectral (BIS) monitors in the PICU to aid the clinical assessment of sedated, paralyzed patients. The implementation process included a survey, an internal validation process and staff education.

To evaluate other institutions' use of BIS monitors in different age groups and in paralyzed patients, surveys were distributed to PICU pharmacists in the United States. The purpose of the internal validation process was to ensure the comfort level of the physicians and nurses with the BIS monitors. The validation process was designed as a prospective, observational study. Mechanically ventilated patients admitted to the PICU who were receiving intravenous sedation were included in the study. Exclusion criteria included the use of paralytics, head trauma, history of seizures, or significant encephalopathy. The nurse assessed the level of sedation as inadequate, adequate, or excessive. The corresponding BIS value was also recorded. To eliminate evaluator bias, minimal education as to the meaning of the BIS values was provided to both the physicians and nurses. The data was evaluated to determine a possible correlation between the BIS value and the nurse's assessment.

The correlation data in addition to the survey results will be used to develop guidelines for the use of BIS monitors in the PICU. It is estimated that the monitors will be used primarily in sedated and paralyzed PICU patients.

### **Learning Objectives:**

State the consequences of inadequate sedation in a pediatric patient.

Describe the role of Bispectral (BIS) monitoring in the assessment of sedated, paralyzed pediatric patients.

### **Self Assessment Questions:**

List two consequences of both under and over sedation in a pediatric patient.

Define adequate sedation using a range of BIS values.

**A REVIEW OF THE OUTCOMES OF SWITCHING FROM INTERMEDIATE OR LONG-ACTING INSULINS TO INSULIN GLARGINE IN A VETERAN DIABETIC POPULATION.**

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Insulin glargine is the first insulin with a reported 24-hour duration and peakless activity, which may reduce glucose excursions and thus improve diabetic control. Five studies in the literature have assessed the effects of converting from older intermediate and long-acting insulin to insulin glargine. These studies reported no significant differences in the primary outcome of change in HgbA1c. However, some of these studies found that insulin glargine showed a statistically significant benefit in the secondary outcomes of weight gain and occurrence of nocturnal hypoglycemic episodes. This study reports the results from a retrospective chart review observing the effects of converting from intermediate and long-acting insulin to insulin glargine in a veteran diabetic population. The primary outcome in this study is to evaluate change in HgbA1c. Secondary outcomes are hypoglycemic occurrence, weight gain, concurrent medications, and provider adherence to American Diabetes Association treatment guidelines. Currently, there are 17 patients enrolled in this ongoing observational study. Preliminary results indicate insulin glargine is associated with decreased weight gain. However, there is presently no difference between the pre- and post conversion HgbA1c.

**Learning Objectives:**

Review insulin glargine (Lantus).  
Review current literature comparing intermediate and long-acting insulins with insulin glargine.

**Self Assessment Questions:**

Insulin glargine may be mixed with prandial insulins.  
True False  
Previous studies have displayed advantages of insulin glargine including:  
A. Decreased weight gain  
B. Decreased nocturnal hypoglycemia  
C. Neither A nor B  
D. Both A and B

**IMPACT OF PHARMACIST INTERVENTION ON LDL-C GOAL ATTAINMENT IN DIABETIC PATIENTS TAKING STATINS IN FAMILY PRACTICE AND INTERNAL MEDICINE CLINICS**

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Purpose: The 2001 Executive Summary of the Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III) escalated diabetes from a risk factor to a coronary heart disease risk equivalent. Diabetic patients now have an LDL-C goal of less than 100 mg/dL. Patient noncompliance and provider nonadherence to guidelines present a need for education. The purpose of this study is to determine if a pharmacist intervention will increase the number of diabetic patients reaching their goal LDL-C.

Methods: Patients with diabetes and hyperlipidemia who are currently taking statins may participate. Patients were identified by ICD-9 codes and received letters inviting them to participate in the study. The provider intervention consists of reviewing evidence-based clinical guidelines (ATP-III, NCEP). A risk calculator tool for the physicians' personal digital assistants was provided. The patient intervention consists of a group education session in which the pharmacist discusses modifiable risk factors for coronary heart disease. A knowledge exam provided by the National Heart, Lung, and Blood Institute assesses patient knowledge on cholesterol on three occasions. Recommendations regarding drug therapy or assessment of lab values are given to the providers. The primary outcome is the number of patients at LDL-C goal of less than 100 mg/dL at six months. Patients serve as their own controls.

Results: Patient enrollment and data collection are currently ongoing. Baseline clinical data for the 151 eligible study patients include 80 females (53%) and 71 males (43%). Seventy-six patients (50.33%) are currently at goal. The seventy-five patients (49.67%) who are not at goal require an average reduction of 30.43 mg/dL. Patient education sessions will be held in February.

Conclusion: Analysis of data collection is anticipated by April 2003.

**Learning Objectives:**

Recognize diabetes as a coronary heart disease risk equivalent and that diabetic patients have an LDL-C goal of less than 100 mg/dL.  
Describe the effects of a pharmacist intervention with patients and providers on LDL-C goal attainment.

**Self Assessment Questions:**

Diabetics should be treated to a goal LDL-C of less than 130 mg/dL. T F  
Cardiovascular disease is the leading cause of death in diabetic patients. T F

**PREVENTION OF VENOUS THROMBOEMBOLISM USING WARFARIN SODIUM AT AN UNCONVENTIONAL TARGET-INR RANGE (1.8-2.5) AFTER TOTAL HIP OR KNEE REPLACEMENT: A RETROSPECTIVE EVALUATION OF ACTUALLY ACHIEVED INR LEV**

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**Background:** Patients who undergo elective hip and knee replacement surgery are at a high risk of developing harmful, or even fatal complications. Warfarin is commonly used in these patients but can also cause bleeding complications if the blood becomes too thin. Some orthopedic surgeons who refer the above subset of patients to a warfarin clinic at University of Illinois at Chicago Medical Center request warfarin to be maintained at a goal range of 1.8-2.5, with the intent of minimizing post-surgical bleeding complications by keeping the blood slightly thicker than recommended.

**Purpose:** The purpose of this study is to compare the actual thickness of blood achieved when the goal-range INR is 1.8-2.5, compared to the that of a group of patients who have the standard goal-range INR (2.0-3.0). This study will also examine the incidence of clotting and bleeding complications that have occurred at various levels of thickness of blood (categories of INR achieved).

**Method:** This retrospective, observational, explanatory study will examine the medical records of consecutive aforementioned subset of patients referred to the Antithrombosis Clinic (ATC) at UIC during the period from August 1996 to December 2002. The amount of patient-time spent in various INR ranges (therapeutic, subtherapeutic, and supratherapeutic) as well as the incidence of thromboembolic or hemorrhagic events will be compared for patients with a goal INR of 1.8-2.5 and 2.0-3.0.

**Results:** Pending.

**Significance:** The results of this study can help determine if the lower-than-conventional target INR range, used in the above subset of patients at UIC, affects the thickness of blood actually achieved. It could also help us see if the various ranges of thickness of blood achieved affects the incidence of bleeding and clotting complications observed in our study group. This clinic-specific data can help determine if the current lower target-INR used in our clinic provides optimal patient care.

**Learning Objectives:**

Discuss the rationale of maintaining a lower goal INR range in TKR and THR patients.

Determine whether using a lower goal INR in TKR and THR patients displays improved safety and efficacy.

**Self Assessment Questions:**

What is the standardly accepted goal INR range for the prophylactic treatment of DVT and PE in post TKR and THR patients?

What is an alternate treatment to coumadin for the management of this patient population?

**EVALUATION OF ANTIBIOTIC RESISTANCE TO BROAD-SPECTRUM ANTIBIOTICS AT A NOT-FOR-PROFIT TERTIARY MEDICAL CENTER IN MILWAUKEE, WISCONSIN**

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The availability and widespread use of broad-spectrum antibiotics for prophylaxis and treatment of infections has led to the emergence of antibiotic resistance worldwide. Guidelines regarding the prevention of antibiotic resistance have been developed on a national level. However, these guidelines have not been effectively implemented by many institutions. Currently, at our institution, there is no established program to control antibiotic prescribing. Furthermore, no analysis has taken place to monitor the relationship between antibiotic use and resistance. Thus, the application of national guidelines has not been established on an institutional level. The intent of this study is to identify a relationship between the current use of broad-spectrum antibiotics, focusing on piperacillin/tazobactam, cefepime, and ciprofloxacin, along with the current use of vancomycin, and antibiotic resistance patterns specific to those agents at our institution. First, an evaluation of antibiotic resistance to the four mentioned antibiotics was conducted. Next, over a four-week period from October to November 2002, every patient at our institution on the mentioned antibiotics was evaluated regarding the appropriateness of the agent as empiric therapy per national guidelines. Once culture and sensitivity reports were available, each patient case was further analyzed to determine appropriateness of antibiotic therapy. Finally, a cost analysis involving the use of these antibiotics was completed. Upon final analysis and presentation of the data, institutional guidelines for the appropriate use of antibiotics will be established and implemented.

**Learning Objectives:**

Describe the importance of monitoring antibiotic resistance patterns at your institution.

Describe the need for antibiotic use guidelines specific to your institution.

**Self Assessment Questions:**

True or False - Resistance patterns do not vary amongst different institutions.

ICU patients had a greater than/equal to/lesser than likelihood of being infected with a multi-drug resistant gram-negative microorganism.

## **IMPACT OF A COMPREHENSIVE COMPUTER SYSTEM ON THE CLINICAL PHARMACIST'S ROLE AND MEDICATION SAFETY**

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Medication errors and preventable adverse drug events (ADEs) remain a prominent concern for healthcare institutions. Sophisticated technology such as clinical information systems (CIS) and computerized physician order entry (CPOE) offer significant tools to promote safer and more effective medication use. Comprehensive computer systems can provide timely patient information, allowing for a more efficient process in delivering patient care. This can also streamline communication among all healthcare disciplines and significantly change current workflows. As pharmacists have a responsibility in reducing preventable ADEs, clinical information systems are certain to redefine how the pharmacist carries out this responsibility. The purpose of this study is to evaluate the impact of a fully integrated computer system on the clinical pharmacists' role in improving medication safety.

Institution-specific high-risk medications and patient groups were selected for evaluation: digoxin, warfarin, and renally insufficient patients. Within these subjects, specific components in which a clinical pharmacist can directly impact safe medication use were measured: the frequency of digoxin monitoring, percentage of completed warfarin counseling, and incidence of appropriate renal dosing of selected medications. Pre-CIS implementation measurements were obtained through retrospective chart review. Post-implementation measurements will be collected for comparison through computer-generated reports, and prospective and retrospective chart review.

### **Learning Objectives:**

Define common terminology used when discussing comprehensive computer systems in healthcare.  
Explain how pharmacists can utilize the tools of a fully integrated computer system to deliver patient safety and care.

### **Self Assessment Questions:**

Define the terms Clinical Information System, Clinical Decision Support, and the acronym CPOE.  
List 3 computer tools used that enable pharmacists to promote safe medication use.

## **PROSPECTIVE EVALUATION OF FEEDING TOLERANCE OF BOLUS VERSUS CONTINUOUS EARLY ENHANCED FEEDING IN BRAIN-INJURED PATIENTS**

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Early nutritional support has demonstrated improved clinical outcomes in critically ill patients. Enteral feeding has been shown to improve wound healing, decrease GI mucosal permeability, and lower infection rates. Adequate nutritional support is crucial in the recovery of brain-injured patients. Patients with severe brain injury exhibit characteristics such as hypercatabolism, hypermetabolism, and nitrogen wasting. Feeding intolerance in brain-injured patients has been associated with delayed gastric emptying, decreased esophageal sphincter pressure, and elevated intracranial pressure. The inability to meet nutritional requirements in these patients may contribute to increased hospital complications and cost. In this study we seek to compare the tolerability of continuous versus bolus feeding administration in brain-injured patients to determine if there is a difference.

Prospective, randomized, open label study of 40 brain-injured patients admitted to a Neurotrauma Unit who require enteral nutrition. Patients were excluded from this study if they were: less than 18 years old; would likely tolerate regular diet within 24 hours; or patients who received post-pyloric feeding. Patients were randomized to either the continuous or bolus feeding group within 24 hours of admittance. Caloric requirements were calculated based on 25-35 Kcal/kg/d and enteral feeding was initiated within 72 hours of patient's admittance at the calculated goal rate with residual volumes checked every four hours. The primary endpoint was feeding intolerance, which was determined by measurement of gastric residual volume.

Preliminary results are pending ongoing data collection

No conclusions can be drawn at this time, data collection is ongoing.

### **Learning Objectives:**

To better understand the nutritional needs of traumatic brain-injured patients

To determine if brain-injured patients demonstrate a difference in feeding tolerability when fed by continuous versus bolus administration.

### **Self Assessment Questions:**

Severe head injury is associated with a hypercatabolic state this can lead to an increased risk of infectious complications and mortality.

True or False

Feeding intolerance in brain-injured patients has been associated with: a) delayed gastric emptying, b) decreased esophageal sphincter pressure c) elevated intracranial pressure d) all of the above

## **DUPLICATION OF ANTIBIOTIC COVERAGE IN THE OPERATING ROOM FOR INPATIENTS AT A TEACHING HOSPITAL**

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Appropriate use of antibiotics is a key challenge for the health care system today. Unnecessary antibiotic use can lead to increased antimicrobial resistance, and increased hospital spending. In 1999 the Hospital Infection Control Practices Advisory Committee developed their guidelines for prevention of surgical site infections. This document outlines both appropriate and inappropriate use of antibiotics in surgery. These guidelines suggest that antimicrobial prophylaxis is not indicated for patients who are already therapeutic on antimicrobial agents perioperatively for established infections. Despite this, it has been noted that inpatients that are therapeutic on antibiotics at the time of their surgical procedure may still be receiving perioperative antibiotics at Froedtert Hospital. For this study, inpatients undergoing procedures in the operating room (OR) were identified from preprinted daily OR schedules. Computerized medication profiles were retrospectively reviewed for the time period leading up to the procedure for each inpatient identified. Both inpatient and operating room antibiotic use was determined from these records, and analyzed for duplication of antimicrobial spectrum of activity. This study examined data from 20 OR days and accounted for 152 procedures on 132 patients. It was found that patients had been receiving inpatient antibiotics prior to 47 percent of procedures, and that perioperative antibiotics were given for approximately 59 percent of procedures. Overall, 36 percent of perioperative antibiotics given in the OR were for patients already treated with antibiotics, however a portion of this was for continuation of current therapy. Approximately 16 percent of perioperative antibiotics given were considered inappropriate duplication of antibiotic spectrum. Based on this study, it is expected that approximately 175 episodes of inappropriate duplication of antibiotic therapy would occur in the OR at Froedtert Hospital annually. A summary of data collected during the course of this study will be presented.

### **Learning Objectives:**

To determine the incidence of inappropriate duplication of antibiotic therapy given in the operating room at Froedtert Hospital.

To identify the need for a change in the OR practice model as it pertains to use of perioperative antibiotics.

### **Self Assessment Questions:**

List two of the three major guidelines pertaining to surgical site infection prophylaxis.

List the four surgical wound classifications and identify which classes require the use of antimicrobial prophylaxis.

## **PATIENT CONTROLLED ANALGESIA IN PEDIATRICS**

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### **PATIENT CONTROLLED ANALGESIA IN PEDIATRICS**

**Purpose:** The use of morphine patient controlled analgesia (PCA) in pediatrics is evaluated with regards to dosing, adverse effects and efficacy.

**Methods:** The patients included in this monitor were opiate naïve post operative surgical patients in their first 72 hours of PCA use. The original PCA prescription was documented in terms of bolus dose, lockout interval, basal rate and hourly maximum dose. All modifications of these prescription parameters were recorded for the 72 hour period. Morphine dosing is described on a mg/kg basis and was documented as the total usage by each patient on an hourly basis. The basal rate and injection attempts received were totaled and divided by the patient's weight to determine this hourly parameter. Adverse effects monitored included nausea, vomiting, constipation and opiate induced respiratory depression. Pediatric pain scores were determined by one of three pain scales used by our pain service. They were then converted to a scale of 0 to 1 for comparison purposes.

**Results:** 65 patients were monitored. Their ages ranged from 1.3 –19.6 yrs (average 11.4 yr). The initial bolus dose average was 0.022 mg/kg/dose. The initial lockout interval average was 9.2 minutes. The initial basal rate average was 0.014 mg/kg/hr. The initial hourly maximum dose was 0.12 mg/kg/hr. The average total morphine dose received was 0.043 mg/kg/hr. 24/65 (36%) patients received ketorolac while on morphine PCA. 21/69 (35%) patients had itching. 8/69(12%) patients had nausea. 1/69(0.02%) patient had constipation. The average pain score was 0.29, with zero equaling no pain. **Conclusion:** The average dose requirements were no more than the usual continuous infusion or intermittent dose. Itching was the most common adverse effect encountered. Post operative pain is well controlled with morphine PCA usage in pediatric patients and similar to adult literature.

#### **Learning Objectives:**

The incidence of adverse effects for pediatric patients using morphine PCA's

The usual (average) hourly PCA dose in pediatric patients

#### **Self Assessment Questions:**

What type of adverse effects do pediatric patients commonly encounter when on morphine PCA's ?

What is the average hourly dose of morphine for pediatric patients when using PCA's for treatment of post operative pain ?

## **EVALUATION OF CLOPIDOGREL USE IN PATIENTS PRESENTING WITH ACUTE CORONARY SYNDROME AND UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY**

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Clopidogrel is an oral antiplatelet agent, which has recently been shown to be beneficial when added to aspirin in patients presenting with unstable angina/non-ST-segment elevation myocardial infarction. The 2002 American College of Cardiology/American Heart Association (ACC/AHA) guidelines for the management of acute coronary syndrome (ACS) recommend starting clopidogrel as soon as possible on admission and continuing therapy for at least 1 month and up to 9 months in patients who are not at increased risk for bleeding. If coronary artery bypass graft (CABG) surgery is planned, clopidogrel should be withheld for at least 5 to 7 days prior to surgery due to increased risk of bleeding with preoperative clopidogrel exposure. The Detroit Medical Center (DMC) has recently developed an ACS pathway, which incorporates the use of clopidogrel based on ACC/AHA recommendations.

A retrospective study will be conducted at Harper University Hospital to evaluate the usage pattern of clopidogrel in patients presenting with ACS and undergoing CABG surgery between March 2002 and August 2003. Other objectives will include assessing the frequency of bleeding complications and evaluating compliance to the DMC guidelines for management of ACS. Eligible patients will be identified from catheterization laboratory and CABG databases. Data collection will include the frequency of clopidogrel use, time of initiation, dosage, time of discontinuation prior to surgery, and frequency of bleeding or other complications. Preliminary results of the study will be presented.

#### **Learning Objectives:**

To understand the role of clopidogrel in patients who have acute coronary syndrome without ST-segment elevation.

To evaluate current practice of using clopidogrel in patients with acute coronary syndrome undergoing coronary artery bypass graft surgery.

#### **Self Assessment Questions:**

Clopidogrel is an antiplatelet agent shown to have beneficial effects in addition to aspirin in patients with acute coronary syndrome without ST-segment elevation. T or F

According to the ACC/AHA practice guidelines for acute coronary syndrome, clopidogrel should be withheld for at least 5 to 7 days prior to surgery. T or F

## **APPLYING QUALITY IMPROVEMENT PRINCIPLES TO REDUCE MEDICATION TURN-AROUND-TIME**

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The turn-around-time (TAT) for medication delivery is defined as the amount of time it takes for a medication to be delivered to a nursing unit once the order has been received in the pharmacy. Orders that arrive to the pharmacy may be classified as stat, first dose antibiotic/heparin, now/ASAP, or routine orders. Depending on the classification of the order, pharmacy has goals for the TAT of the medication. The goals are monitored monthly within the department and as part of a service level agreement between pharmacy and nursing.

The goal for first dose antibiotic/heparin orders is to have 90% of the medications delivered to the nursing unit within 30 minutes of order receipt. Currently, sixty-eight percent of these orders are delivered within 30 minutes. The purpose of this project is to move this percentage closer to the 90% goal. The scope of this project will be to affect the time in the process once a label has been generated from the printer until the time of delivery. This will be accomplished by applying quality improvement techniques of the 7-step process which will include a.) identifying key customers and suppliers, b.) establishing agreed-upon requirements, c.) identifying gaps, d.) describing and analyzing the current process, e.) developing and executing solutions, and f.) measuring and monitoring.

Improvements will have positive business results in each quadrant of the hospital/department balanced scorecard. These quadrants include quality, customer service, quality of work life, and financial performance. The results will be presented to department and hospital leadership to demonstrate knowledge and application skills of process improvement principles to receive a Quality Achiever certificate.

### **Learning Objectives:**

To identify gaps in the process that contribute to delayed medication turn-around-time.

To learn how to apply techniques of the 7-step process to improve a process.

### **Self Assessment Questions:**

The measurement of turn-around-time begins once a physician has written an order. T or F

The 7-step process does not include identifying key customers and suppliers. T or F

## **CALCINEURIN SPARING IN LIVER TRANSPLANTATION**

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**Purpose:** The use of calcineurin inhibitors (CNI) and corticosteroids remains the foundation of immunosuppressive regimens in orthotopic liver transplantation. Studies have experimented with decreasing or discontinuing the use of CNIs and corticosteroids while adding on other immunosuppressive drugs without sacrificing graft and patient survival. However, no consensus has yet been achieved that clearly defines the optimal levels of calcineurin inhibitors.

**Methods and Results:** This was a retrospective study evaluating orthotopic liver transplant patients on a tacrolimus sparing protocol (Group A, n=12) as compared to an evenly matched number of historical cohorts utilizing a standard tacrolimus protocol (Group B, n=12) for a 3 month follow-up post-transplantation. Immunosuppression for Group A included tacrolimus with troughs of 3-5ng/ml by 3 months, mycophenolate mofetil 1000mg bid, and 100 day prednisone taper. Immunosuppression for Group B was comprised of tacrolimus with troughs of 5-10ng/ml by 3 months and 100 day prednisone taper. Preliminary results of 5 subjects in each arm reveal a 40% rejection rate in Group A and 60% rejection rate in Group B. Average tacrolimus levels at 3 months for Group A were 13.5ng/ml with 2 of the 5 subjects switched from tacrolimus to cyclosporine. Average creatinine for Group A at 3 months was 3.14mg/dl. In addition, at the end of follow up none of the patients in Group A achieved desired regimen of mycophenolate mofetil 1000mg bid.

**Discussion:** Preliminary results show that desired calcineurin sparing levels were not achieved in any of our 5 patients at 3 month follow up. None of the patients in Group A were maintained on the goal regimen of mycophenolate secondary to leukopenia and gastrointestinal intolerance. Preliminary results show that Group A did have an overall lower incidence of rejection but this is likely attributed to the higher degree of immunosuppression.

### **Learning Objectives:**

Understand the rationale for the use of calcineurin sparing protocols in transplantation.

Assess the benefits versus risks with the use of both calcineurin sparing and steroid withdrawal regimens in liver transplantation.

### **Self Assessment Questions:**

What is one major toxicity of calcineurin inhibitors?

What are two adverse effects that limit the use of mycophenolate mofetil?



## THE TREATMENT OF MEN WITH OSTEOPOROSIS FOLLOWING A HIP FRACTURE

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Men suffer from the same osteoporosis-related fractures as do women, yet their outcomes and treatment status have not been extensively studied. While women are at higher risk than men of suffering osteoporosis-related hip fractures, men account for roughly 20% to 30% of all hip fractures. The goal of this study is to evaluate the osteoporosis-related treatment status and bone mineral density evaluation of men prior to suffering an osteoporosis-related hip fracture, on discharge from hospitalization due to hip fracture and at their primary care visit following hip fracture. In addition, 12-month mortality rates following the hip fracture will be examined. Furthermore, we will assess for risk factors, the evaluation and management of secondary causes, and degree of morbidity of osteoporosis-related hip fractures in men.

We will use data gathered from performing a chart review of subjects who meet the inclusion criteria. Subject selection will consist of a chart review of male patients, who have suffered a hip fracture requiring admission to Wm S. Middleton Memorial Veterans Hospital, Madison, WI. Exclusion from evaluation will include: patients with fractures caused by pathological conditions or high-energy trauma and patients with fractures 2cm or more below the lesser trochanter. Subjects will be identified through doing a search by ICD-9 codes of newly diagnosed hip fracture requiring admission.

In drawing conclusions from our findings, we look to use the results as a basis for increasing practitioner awareness about the treatment and prevention of osteoporosis-related hip fractures in men.

Osteoporosis-related hip fractures are associated with high incidence of postfracture disability and mortality in both men and women. Nevertheless, men often receive less osteoporosis-related treatment. Increased awareness or risk factors and appropriate countermeasures could decrease the incidence of hip fractures in men.

### Learning Objectives:

Evaluate the outcome and osteoporosis-related treatment status of men with hip fracture.

Illustrate the need for higher awareness for older men at risk of suffering an osteoporosis-related hip fracture.

### Self Assessment Questions:

True or False. Men are adequately evaluated and treated for the prevention of osteoporosis-related hip fractures.

True or False. Compared to women, men are at a significantly lower risk of suffering an osteoporosis-related hip fracture; therefore justifying the lack of measures taken to prevent such fractures.

## COMPARISON OF TOTAL COSTS ASSOCIATED WITH INFLIXIMAB AND ETANERCEPT USE IN RHEUMATOID ARTHRITIS

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**Purpose:** The objective of this study was to compare total costs associated with use of two tumor necrosis factor agents, infliximab and etanercept, for treatment of rheumatoid arthritis (RA) within a large national health plan.

**Methods:** This study employed a retrospective analysis of medical and pharmacy claims related to the use of infliximab and etanercept. The study explored claims data from January 1, 2001 to September 30, 2002. Various areas of comparison were direct cost associated with the drug, costs associated with other rheumatoid arthritis drugs, costs associated with all other drugs, and costs associated with medical claims. Data was also divided by line of business (Medicare, self-funded, and commercial) for further refinement.

**Patients:** The study population was selected from all rheumatoid arthritis patients from large group businesses (=50 members) across the network of the health plan. Inclusion for consideration required at least one paid claim for etanercept or infliximab within the study period.

**Results:** Overall spending per utilizing member per month (PUMPM) was higher for etanercept in self-funded and commercial subgroups. PUMPM was found to be higher for infliximab in the Medicare subgroup. Comparison showed that utilization differed depending on the line of business.

**Conclusion:** Considering the scope of the study, we found that etanercept exceeded infliximab when accounting for costs of all drugs and medical claims associated with RA. Evaluation of the indirect costs associated with administration of these two drugs (e.g. travel to/from clinic appointments, lost days of work/productivity) may be a factor that could produce different results.

### Learning Objectives:

Gain appreciation of sources of cost accrued by RA patients other than that of the drug itself.

Enable comparison of etanercept and infliximab use across different lines of business.

### Self Assessment Questions:

Which of the following cytokines are associated with the inflammation process of RA?

- A. TNF- $\alpha$  and interleukin-1
- B. TNF- $\beta$  and interleukin-1
- C. TNF- $\alpha$  and TNF- $\beta$
- D. C-reactive protein and TNF- $\alpha$

What drug is commonly given with infliximab to reduce the production of antibody development against it?

- A. methotrexate
- B. sulfasalazine
- C. cyclosporine
- D. azathioprine

## **A RETROSPECTIVE EVALUATION OF CARDIAC TRANSPLANT PATIENTS ON CALCINEURIN INHIBITORS WITH RENAL INSUFFICIENCY WHO WERE CONVERTED TO RAPAMYCIN**

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Calcineurin inhibitors such as cyclosporine and tacrolimus are used in most immunosuppressive regimens after cardiac transplant. As with all medications, the adverse effects of these immunosuppressants often limit their utility. One of the limiting factors to calcineurin inhibitor use is nephrotoxicity. Rapamycin is an immunosuppressive agent that acts through a different mechanism to produce immunosuppression without nephrotoxicity. Several studies have been performed, focusing on converting transplant patients with calcineurin inhibitor-induced nephrotoxicity to rapamycin to improve renal function. The purpose of our study is to determine if converting cardiac transplant outpatients with a serum creatinine concentration greater than 2mg/dL from calcineurin inhibitors to rapamycin will improve renal function.

A retrospective chart review is being conducted on cardiac transplant outpatients who were converted to rapamycin from a calcineurin inhibitor after their serum creatinine concentration increased above 2 mg/dL. Exclusion criteria include pediatric patients, patients with active malignancies, and patients who are pregnant or lactating. Variables being studied include baseline calcineurin inhibitor dose and last serum concentration, serum creatinine concentrations, rapamycin doses and serum concentrations, baseline and post-conversion biopsy results, and laboratory data including complete blood count, lipid panel, hepatic panel, and serum potassium concentration. The primary study outcome is to compare serum creatinine concentrations of patients before and at three and six months after they are converted to rapamycin. Secondary outcomes include infection rate, transplant rejection rate, and rate of adverse events.

The results of this pilot study will be used as the foundation for a large-scale randomized trial comparing renal function in cardiac transplant outpatients who were or were not converted to rapamycin for calcineurin inhibitor-induced nephrotoxicity.

### **Learning Objectives:**

To understand the mechanism of calcineurin inhibitor-induced nephrotoxicity

To understand the role of rapamycin in cardiac transplant patients with poor renal function

### **Self Assessment Questions:**

Calcineurin inhibitor-induced chronic nephrotoxicity is due to vasoconstriction and direct damage to the tubular epithelial cells of the kidney. T or F

Cardiac transplant patients are at higher risk for nephrotoxicity than other transplant patients. T or F

## **UTILIZATION AND PRESCRIBING OF THE FORMULARY 5HT-3 RECEPTOR ANTAGONIST IN A COMMUNITY HOSPITAL**

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The purpose of this study was to determine the prescribing and efficacy of Anzemet (dolasetron) and Zofran (ondansetron) as a cost-effective therapy in the prevention of postoperative nausea and vomiting (PONV) and chemotherapy induced nausea and vomiting (CINV). PONV and CINV are the two most common indications for the 5HT-3 receptor antagonists. Studies have shown that each of the products are comparable in efficacy and safety.

A retrospective chart review was conducted and a data collection tool was developed to provide information on the prescribing of each product. The primary outcome was correct indication and treatment regimens for patients receiving an anti-emetic. A secondary outcome measured the number of additional doses required after the initial anti-emetic dose had been started.

Anzemet (dolasetron) at a cost of 59% less than that of Zofran (ondansetron), is the most cost-effective way to manage both PONV and CINV, this formulary change saved the hospital approximately \$20,000 annually.

### **Learning Objectives:**

To determine prescribing and efficacy of dolasetron and ondansetron for PONV and CINV.

To determine the number of additional doses required after the initiation of an antiemetic.

### **Self Assessment Questions:**

Dolasetron showed a decrease in total usage of antiemetic therapy, which improved cost savings to the patient and the hospital? T or F

Refractory nausea and vomiting was the most common "other" use for the 5HT-3 receptor antagonist in the patient population that was investigated? T or F

## **THE EFFECT OF NESIRITIDE ON FLUID RETENTION IN PATIENTS UNDERGOING COX-MAZE PROCEDURE FOR THE TREATMENT OF ATRIAL FIBRILLATION: A PILOT STUDY**

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The maze procedure is a widely used surgical treatment for medically refractory atrial fibrillation. Fluid retention that is resistant to diuretics is a common complication to this procedure. Researchers have attributed this fluid retention to a decreased secretion of atrial natriuretic peptide (ANP). ANP has potent natriuretic and diuretic properties and has been shown to promote diuresis and reduce fluid retention. B-type natriuretic peptide (BNP) acts on the same receptors as ANP to inhibit the rennin-angiotensin system to promote diuresis.

The purpose of this study is to determine if the commercially available recombinant BNP, nesiritide (Natrecor®), will reduce fluid retention in these maze procedure patients and provide a reduction in ICU and total hospital length of stay.

In order to determine the effects of nesiritide on fluid retention in maze procedure patients, a retrospective chart review will be conducted on patients who have undergone this procedure in the previous 2 years. This study will include patients who have undergone an elective maze procedure for refractory atrial fibrillation in the previous 2 years and will compare those patients who have received nesiritide + standard treatment with diuretics vs. those who received diuretics alone. Patients that are pregnant, pediatric (< 18 years of age), on dialysis or have a contraindication to nesiritide are excluded from this study. Data to be collected include: hemodynamic parameters, urine output, concomitant medications, and BNP serum concentrations. The primary outcome of this study is to compare urine output in patients who have received nesiritide vs. those patients receiving standard treatment with diuretics alone. Secondary outcome measurements include hemodynamic parameters, postoperative ICU length of stay, and total hospital length of stay. The results of this pilot study will determine if a large scale randomized trial will be necessary to evaluate the effectiveness of nesiritide in this patient population.

### **Learning Objectives:**

To describe the possible mechanisms of fluid retention in patients undergoing a maze procedure for medically refractory atrial fibrillation.

To discuss the rationale and possible role of nesiritide (Natrecor®) in treating these maze procedure patients.

### **Self Assessment Questions:**

Fluid retention following the maze procedure is thought to be due to a surgically induced loss of natriuretic peptides. True or False

Nesiritide is thought to decrease fluid retention by inhibiting the renin-angiotensin system. True or False

## **EVALUATION OF A PERI-PROCEDURAL EDUCATION PROGRAM FOR PATIENTS UNDERGOING WARFARIN INTERRUPTION**

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Patients who require temporary discontinuation of warfarin for a medical procedure and are at high thromboembolic risk undergo peri-procedural anticoagulation with enoxaparin at the Madison VAMC. Patient understanding and adherence is important for successful peri-procedural anticoagulation. This is a 12-month prospective observational study evaluating patient knowledge, self-injection skills, attitudes, and satisfaction following a structured peri-procedural educational program.

The educational material used by the Madison VA Anticoagulation Clinic was revised prior to study initiation. A new educational booklet and dosing schedule for warfarin and enoxaparin was developed. An 11-item knowledge questionnaire was also developed and revised after pre-testing on a control group of patients with no prior use of warfarin or enoxaparin.

The educational program incorporates one-on-one patient teaching regarding the rationale for bridging and appropriate use of enoxaparin. The patient is provided with an educational booklet and a dosing schedule. After the Anticoagulation Clinic provider demonstrates the injection technique, the patient returns the demonstration and is graded on self-injection technique. At the conclusion of the educational session, the patient completes a knowledge questionnaire. Following the procedure, the patient completes two additional questionnaires assessing his/her attitude towards the bridging process and satisfaction with the education provided. Data collection is ongoing. Preliminary results will be presented.

### **Learning Objectives:**

State 3 instructional objectives for a peri-procedural educational program for patients undergoing warfarin interruption.

Develop an educational program for patients undergoing warfarin interruption.

### **Self Assessment Questions:**

True or False. Patient understanding of when to stop and restart warfarin and enoxaparin is imperative for successful peri-procedural anticoagulation.

True or False. Most patient education materials related to the use of anticoagulants are written at or below the 8th grade level.

## **INSULIN THERAPY IN THE ADULT INTENSIVE CARE UNIT: PHASE I OF II: PATIENT POPULATION COMPARISON**

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Stress-induced hyperglycemia is a common problem among critically ill patients. It is associated with an increased risk of infectious complications, inhibition of wound healing, and an increased mortality. A 2001 study by VandenBerghe suggested that an intensive insulin infusion regimen (goal blood glucose between 80 and 110 mg/dL) significantly reduced morbidity and mortality when compared to a conventional regimen (goal blood glucose between 180 and 200 mg/dL). The purpose of this study is to determine if results from the VandenBerghe study could be extrapolated to the population at St. Vincent's Hospital based on the similarity of the patient populations. Patient characteristics from the control group who received a conventional insulin regimen from the VandenBerghe study were compared to a population from St. Vincent's Hospital who received a conventional regimen. The VandenBerghe study was conducted in the surgical intensive care unit at the University Hospital of Leuven, Belgium, a teaching-based, 2000 bed hospital. St. Vincent's Hospital is a 655 bed community hospital located in the midwestern United States.

A retrospective chart review was conducted on patients receiving an insulin infusion admitted to the adult ICU and cardiac ICU at St. Vincent's Hospital between December 2001 and November 2002. Patients with diabetic ketoacidosis were excluded. Conventional insulin infusion regimens were titrated to reach a blood glucose ranging from 140-180 mg/dL. The following data were collected: sex, BMI, medical history, mortality, blood glucose prior to and during insulin infusion, renal function, days spent in the ICU, readmission, days on mechanical ventilation or vasopressors, nutrition regimen, antibiotics, signs of infection, and drotrecogin alfa (activated) use. These data will be compared with data from the VandenBerghe control group to determine the comparability of patients and thus the applicability of results.

### **Learning Objectives:**

Compare the VandenBerghe patient control population and the population at St. Vincent's Hospital.

Examine the differences in variables among the patient populations and determine the effects on the applicability of the results.

### **Self Assessment Questions:**

Intensive insulin therapy was defined as a goal blood glucose of 80-110 mg/dL in the VandenBerghe study. True or False  
The control group in the VandenBerghe study is similar to the St. Vincent's population based on the variables examined.  
True or False

## **IDENTIFYING PATIENT BARRIERS TO PHARMACEUTICAL CARE**

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The patient's relationship with their health care practitioner is one of the strongest indicators that the patient will be compliant to his prescribed treatment plan. This means that any barriers that the patient may perceive to pharmaceutical care will adversely effect the overall treatment of our patients. This project was designed to identify what barriers hinder patients from receiving potential benefit from pharmaceutical care, and secondarily to determine if certain patient characteristics tend to correlate with a greater perception of barriers.

The study consists of two test groups, those patients followed by an internal medicine practice that have already been referred to a clinical pharmacy service as a part of a physician-pharmacist collaborative agreement and those who have not been referred to a clinical pharmacy service. Patients are excluded if they are physically or mentally unable to complete the survey or refuse participation. The goal study population is one hundred participants per group. Each group will complete a fifteen question survey based on a five point Likert scale with demographical identification. The two surveys are identical with the exception of one question about the benefit of pharmacist services (experienced benefit by those referred vs. projected benefit by those not referred).

Preliminary results and their potential implications will be discussed at the presentation.

### **Learning Objectives:**

To understand how the Health Belief Model impacts patient care.

To learn which issues represent the most prevalent barriers to pharmaceutical care.

### **Self Assessment Questions:**

If patient perceived barriers are reduced, patients are more likely to view their course of treatment as beneficial. T F

Patient comprehension of pharmacist qualifications appears to be a significant barrier to pharmaceutical care. T F

## **AN ASSESSMENT OF UNMET NEEDS AMONG CURRENT AND POTENTIAL CUSTOMERS OF THE UNIVERSITY OF ILLINOIS AT CHICAGO MEDICAL CENTER OUTPATIENT PHARMACY**

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Many medical centers have an outpatient pharmacy to help ensure continuity of care for their discharged patients and as a convenience to employees. These types of pharmacies often bring additional income into the hospital system. However, many patients choose to receive pharmacy services elsewhere for reasons of convenience. One way for an outpatient pharmacy to retain these customers is to understand their motives for choosing a type of pharmacy and providing services they desire. This may enable the pharmacy to keep current patients and attract new patients as customers. This study is designed to determine attitudes about pharmacy services among current and potential customers of UIC outpatient pharmacies. There are 5 outpatient pharmacies affiliated with the University of Illinois Medical Center at Chicago. These pharmacies service UIC employees, students, discharged hospital patients, as well as patients seen in the ambulatory clinics. The goal of this study is to recognize the needs of pharmacy patients and identify pharmacy services desired by different populations that would help to improve retention and capture rates of pharmacy patients.

Survey will be conducted through the use of in-person interviews at the UIC Outpatient Care Center. Each clinic will be visited routinely (approximately one half day per week) until approximately 10 completed surveys/clinic are obtained. Basic demographic information will be anonymously collected to help identify patient attitudes of specific demographic groups. Attitudes about specific pharmacy services will be determined by asking the patients to rank how important specific pharmacy services are in their selection of a pharmacy on a 5 point scale (1- not important, 5- very important). This will include current and potential services at UIC outpatient pharmacies.

### **Learning Objectives:**

Evaluate the demographic profiles of groups of patients and their selection of pharmacy sites.

Identify pharmacy services desired by current/potential UIC Outpatient Pharmacy patients to improve capture and retention rates.

### **Self Assessment Questions:**

Describe a technique to assess pharmacy services lacking in an outpatient pharmacy.

Name 3 unmet needs of pharmacy patients that could increase retention rates.

## **SAFETY AND EFFECTIVENESS OF CURRENT HOSPITAL WARFARIN DOSING PROTOCOL**

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Currently, there are published guidelines based on clinical trials recommending warfarin therapy be initiated with an initial dose of 5mg, the average maintenance dose. In clinical practice, clinicians often begin warfarin therapy with a loading dose of either 7.5 or 10mg in an attempt to reach a therapeutic INR more quickly. At Lutheran General Hospital, there is an established pharmacy warfarin dosing protocol, using an initial dose of 10mg for all patients. The purpose of this study is to determine the safety and effectiveness of the current warfarin protocol.

A 14-month retrospective chart review was performed for patients initiated and maintained on the pharmacy warfarin protocol for three or more days. Patients on warfarin therapy prior to admission were excluded. Safety was assessed by how often patient INRs exceeded the desired therapeutic range, how often phytonadione administration was required and number of bleeding complications occurring during the first seven days of therapy. Effectiveness was evaluated by how often pharmacists varied from the protocol.

### **Learning Objectives:**

To determine if the use of warfarin loading doses are necessary in the initiation of warfarin therapy.

To determine which patient populations may be at an increased risk for complications if given initial warfarin doses greater than 5mg.

### **Self Assessment Questions:**

Patients who are initiated on warfarin therapy with a loading dose of more than 5mg may reach therapeutic INRs sooner, but are not necessarily more protected against thromboembolic events. T or F

There are certain patient populations at an increased risk for bleeding complications when initiated on warfarin doses greater than 5mg. T or F

## **HEPATITIS C VIRUS: SCREENING, TESTING AND TREATMENT**

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The hepatitis C virus (HCV) is a blood-borne virus that affects over four million individuals in the United States and is one of the leading causes of chronic liver disease and transplantation. Studies conducted at Department of Veterans Affairs medical facilities have shown significant prevalence of HCV infection among the veteran population. Chronic hepatitis patients may be asymptomatic, therefore those who screen for positive risk factors should be tested for HCV and be assessed for treatment.

### **PURPOSE:**

To screen patients with HCV risk factors, improve compliance of laboratory testing and assess treatment qualifications in patients with positive risk factors for HCV at the VA Chicago Health Care System - West Side Campus.

### **METHODS:**

A list of all patients with documented positive risk factors for HCV from 01/01/02 through 12/31/02 was processed. A daily computer generated report was utilized for those patients with positive risk factors that did not have a Hepatitis C surface antibody (HepC s Ab) result documented. This report included those patients who had a serum blood drawn in the past three days for other laboratory tests. A HepC s Ab was then ordered using the existing blood sample. All patients that were hepatitis C positive were then further evaluated for qualifications for treatment based on the National Institute of Health guidelines. RESULTS/CONCLUSIONS: Research in progress.

### **Learning Objectives:**

Identify the screening criteria and qualifications for treatment for HCV.

To determine if the methods implemented helped improve compliance of laboratory testing.

### **Self Assessment Questions:**

What are the risk factors for Hepatitis C?

What are the contraindications for Hepatitis C treatment?

## **DEVELOPMENT OF A PHARMACIST PERFORMED MEDICATION HISTORY PRACTICE MODEL**

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While performing a medication history is considered a standard of pharmaceutical care, many hospitals do not provide pharmacist performed medication histories as a pharmacy service. Currently, medication histories at our institution are performed by the nursing staff as patients present to the emergency department or on the floors when patients are admitted. Physicians also include a medication history as part of the routine history and physical. Data from a previous study at our hospital found the current method to be ineffective and error prone. Although pharmacist performed medication histories have demonstrated the ability to positively impact patient care, implementing a program at our institution would involve a great commitment of pharmacist resources. A project was undertaken to demonstrate the value of a pharmacist performed medication history and to develop a practice model to expand this service hospital wide. Over the course of one month, a pharmacist performed a medication history for all patients admitted to a selected general medicine nursing unit. A complete medication history form was developed to assist in this process. The medication history was recorded and placed in the progress notes within 24 hours of admission. Obstacles and the time spent performing each history were also recorded. The value of the pharmacist performed medication history was assessed by a five-point likert scale questionnaire administered to nurses and physicians and a separate intervention documentation form. Analysis of the initial data will include a survey of pharmacist time spent clarifying medications under the existing system. Finally, a practice model will be developed and the feasibility of expanding the service to a new area of the hospital will be assessed.

### **Learning Objectives:**

To demonstrate the value of pharmacist performed medication histories.

To identify obstacles in the implementation of a pharmacist performed medication history service.

### **Self Assessment Questions:**

Pharmacist performed medication histories positively impact patient care. T or F

Obstacles in the implementation of a pharmacist performed medication history service may include:

- a. Time
- b. Patient's or family member's knowledge of medications
- c. Pharmacist's accessibility to the patient
- d. All of the above

## **RETROSPECTIVE REVIEW OF THE EFFICACY AND SAFETY OF SPIRONOLACTONE TREATMENT FOR RESISTANT HYPERTENSION**

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Despite the numerous antihypertensive therapies now available, it is still difficult to achieve the recommended blood pressure goals in many patients. Spironolactone has been shown to be an effective antihypertensive and has been available for clinical use for many years, however it is not widely used for the treatment of hypertension. Through clinical observations in the hypertension clinic at the William S. Middleton Veterans Affairs Medical Center in Madison, Wisconsin, it appears that many patients with resistant hypertension, who have not responded to multiple-drug therapy, will respond to spironolactone therapy.

The goal of this study is to determine if spironolactone can be safely and effectively used to treat resistant hypertension. All patients at the William S. Middleton Veterans Affairs Medical Center started on spironolactone for hypertension between January 1, 1998 and July 31, 2002 will be identified. Information on patient demographics, blood pressure, concomitant antihypertensive therapy, and serum chemistries will be collected at baseline, at the first follow-up visit, and after 6 months of therapy. Baseline systolic and diastolic blood pressure measurements will be compared separately with the blood pressure measurements both at the first follow-up visit and after 6 months of therapy. A paired t-test will be used to detect any differences between measurements at baseline and at follow-up. The group will then be divided into responders and non-responders based on those able to achieve a blood pressure of less than 140/90. A comparison of the two groups will be made in an attempt to identify characteristics that predict response to spironolactone therapy. Information on both subjective and objective adverse events and withdrawal of therapy will also be collected.

Preliminary results will be presented.

### **Learning Objectives:**

Identify mechanisms by which spironolactone might effectively lower blood pressure in a person with resistant hypertension.  
Identify common adverse events associated with spironolactone therapy.

### **Self Assessment Questions:**

Is spironolactone likely to be an effective therapy for resistant hypertension?  
What adverse events could I expect in a patient started on spironolactone?

## **A COMPARISON OF VENTILATOR-ASSOCIATED PNEUMONIA AMONG PATIENTS RECEIVING INTRAVENOUS PANTOPRAZOLE AND FAMOTIDINE FOR STRESS ULCER PROPHYLAXIS**

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Stress ulcer prophylaxis is the standard of care for critically ill patients on mechanical ventilation, and many agents are available as treatment options. Most clinical experience has been with sucralfate and histamine-2 receptor antagonists. Alkalinization of gastric pH has been associated with microbial overgrowth within the gastric mucosa, potentially leading to nasopharyngeal and tracheal colonization, and nosocomial pneumonia. Previous studies have compared the incidence of nosocomial pneumonia between patients receiving sucralfate and histamine-2 receptor antagonists with conflicting results. The availability of an intravenous proton pump inhibitor has provided an alternative treatment option. With the increased potential for acid suppression by these agents, gastric conditions may leave patients more susceptible to ventilator-associated pneumonia. Analysis of the incidence of pneumonia among mechanically ventilated patients on an intravenous proton pump inhibitor has not yet been performed.

The purpose of this study is to determine if there is a higher incidence of nosocomial pneumonia among patients receiving intravenous pantoprazole compared to those receiving intravenous famotidine for stress ulcer prophylaxis. A retrospective chart analysis was performed to collect data on patients admitted to a 44 bed surgical intensive care unit (SICU) of a large tertiary care university hospital. The agent used for stress ulcer prophylaxis was determined by the patient's service. Patients were grouped according to the selected agent and data was collected during their SICU and hospital stay. Primary outcomes measured include incidence of pneumonia, length of ICU stay, length of hospital stay, and mortality. Analysis of data collected is ongoing at this time.

### **Learning Objectives:**

Understand why stress ulcer prophylaxis may leave mechanically ventilated patients more susceptible to pneumonia.  
Discuss advantages and disadvantages of the available therapies for stress ulcer prophylaxis, and apply them to specific patient populations.

### **Self Assessment Questions:**

The most common organisms associated with ventilator-associated pneumonia in patients receiving stress ulcer prophylaxis are gram positive. T or F  
Proton pump inhibitors are more effective than histamine 2 receptor antagonists at increasing gastric pH to higher levels for longer periods of time. T or F



## EPOETIN ALPHA USE IN A HOSPITAL SETTING

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Epoetin alpha (Procrit<sup>®</sup>, Epogen<sup>®</sup>) is used in both inpatient and outpatient settings to treat anemia in patients with a variety of disease states, including chronic renal failure, human immunodeficiency virus infection, and cancer. Epoetin alpha may also be used to reduce the need for blood transfusions in anemic patients scheduled for general elective surgery. In addition, a new product, darbepoetin alpha (Aranesp<sup>®</sup>), has entered the market and provides for less frequent dosing and potential cost-savings versus epoetin alpha. The purpose of this evaluation will be to assess prescribing patterns for epoetin alpha, to assess the need for a protocol designating how to obtain epoetin alpha from the pharmacy, and to determine whether there would be a cost-benefit associated with establishing a therapeutic interchange between epoetin alpha and darbepoetin alpha in specific patients.

The methods used for this evaluation process will include the designation of all patients receiving epoetin alpha while hospitalized. This information will be gathered by several methods including epoetin alpha charge sheets, epoetin alpha orders, and epoetin alpha administration logs maintained by dialysis unit nurses. The following information will be collected from the designated patients' charts by a pharmacist and maintained on data collection sheets: indication for epoetin alpha; Hgb/Hct values; iron panel values; epoetin alpha dose, route, and frequency; method of epoetin alpha order review; and method of epoetin alpha distribution. This data will be evaluated at the end of the project.

This MUE is currently ongoing, and there are no results to report at this time. Results will be presented at the residency conference.

### Learning Objectives:

To identify appropriate/inappropriate prescribing of epoetin alpha in a hospital setting.

To identify patients in whom a therapeutic interchange between darbepoetin alpha and epoetin alpha would produce a cost-benefit.

### Self Assessment Questions:

The most effective route of epoetin alpha administration in hemodialysis patients is IV. T or F

If epoetin alpha is administered thrice weekly in hemodialysis patients, darbepoetin alpha should be administered only weekly. T or F

## DEVELOPMENT AND IMPLEMENTATION OF A PROCEDURE FOR TRACKING BLOOD PRODUCTS

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Biological products derived from human plasma have an inherent potential risk to transmit communicable diseases. Blood products include immunoglobulins, albumin, and anti-hemophilic factors. The Federal Food, Drug and Cosmetic Act states that upon recall, a pharmacy shall notify customers that received the drug or device. In 1999, the FDA proposed that blood- and plasma-derived products must be tracked from the manufacturer to distributor to patient receiving the product. Pharmacies must be able to efficiently retrieve pertinent data that allow for patient notification to occur in a timely manner. The primary objective of this project is to develop an efficient procedure to track blood product distribution as dictated by federal laws. Patient safety and compliance with these regulations are the major forces for the development of this procedure.

Several aspects of distribution will be examined including automated dispensing, computerized physician order entry capabilities, existing software programs, and administration documentation. A survey of area hospitals was performed to benchmark existing tracking mechanisms as well as their satisfaction. A multi-disciplinary meeting was held to guide decision-making.

A new multidisciplinary procedure was developed. In the event of a recall, lot numbers are easily identified and the patient's information is easily retrieved. Modifications will be made to the procedure based on feedback obtained from a survey of nurses and pharmacists. A mock recall will be performed and the procedure will be fine-tuned based on results.

### Learning Objectives:

To become familiar with laws and regulations related to blood products.

To describe the possible methods that can be utilized in tracking blood products.

### Self Assessment Questions:

Federal laws require only the patient's name and product to be on file in the pharmacy. T or F

Albumin is not considered a blood product that needs to be tracked since it is usually not dispensed for home use. T or F

## **DEVELOPMENT AND IMPLEMENTATION OF THE PHARMACIST'S ROLE IN MANAGING PULMONARY HYPERTENSION PATIENTS THROUGH THE CONTINUUM OF CARE**

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Pulmonary arterial hypertension (PAH) is a rare condition affecting 1 to 2 per 1 million people. Due to its vague symptoms of dyspnea, fatigue, and peripheral edema, the disease is often misdiagnosed as congestive heart failure or chronic obstructive pulmonary disease. Traditional therapy includes anticoagulation, digoxin, diuretics, and vasodilators. When a patient is diagnosed with PAH, determination of optimal vasodilator therapy requires individualized testing with drugs such as adenosine or nitric oxide. Potential vasodilator therapy includes high-dose oral calcium channel blockers, intravenous epoprostenol, subcutaneous treprostinil, or oral bosentan. The purpose of this project is to determine whether a pharmacist's involvement in the inpatient and outpatient treatment of PAH could improve patient satisfaction and quality of life while streamlining therapy.

The activities in the PAH clinic at Rush-Presbyterian-St. Luke's Medical Center in Chicago, Illinois were observed over a two-day period to determine the roles in which a pharmacist could intervene in PAH therapy. Also, treprostinil, a subcutaneous prostaglandin for the treatment of PAH, was added to the Spectrum Health formulary. Protocols were then developed for adenosine vasodilator challenges in the catheterization lab and calcium channel blocker challenges in the medical intensive care unit. Adenosine vasodilator challenges were attended by a pharmacist whenever possible in order to guide infusion titration. Pre-printed orders were created for the initiation and continuation of epoprostenol therapy. These orders included consults for pharmacy to coordinate epoprostenol dosing. Nurses and pharmacists involved with the care of PAH patients were educated on the disease's pathophysiology, diagnosis, and treatment. Additionally, a pharmacist was present at the pulmonary hypertension outpatient clinic to aid in medication counseling and arrange for expedited medication procurement. Finally, patients were administered baseline and follow-up quality of life and patient satisfaction surveys for analysis.

This project is ongoing. Survey results will be reported at the program.

### **Learning Objectives:**

Recognize the signs, symptoms, pathophysiology, and treatment of pulmonary arterial hypertension.

Determine whether patient satisfaction and quality of life are improved when a pharmacist is directly involved in patient care.

### **Self Assessment Questions:**

In this study, patient satisfaction was improved when patients transferred from a non-pharmacist-involved pulmonary hypertension clinic to Spectrum Health's pulmonary hypertension clinic. T or F

Bosentan is first-line therapy in Class IV pulmonary arterial hypertension, since it is administered orally. T or F

## **GABAPENTIN USAGE OPTIMIZATION IN A VA POPULATION**

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Gabapentin is currently being prescribed for a wide range of uses including many off-label indications with only marginal data supporting its use. Many practitioners prescribe gabapentin for these off-label indications without any assessment of its effectiveness. Additionally, often times patients are on long-term treatment with gabapentin with little to no knowledge on the part of the patient or provider of the indication for which it was prescribed. Through modification of the ordering screen for computerized prescriber-order entry at VACHCS, this study will determine if alterations in the ordering system alone can optimize usage of gabapentin. Such adjustments include specifying the indication for use to improve patient safety, limiting days supply to promote appropriate dose titration and assessment of efficacy, displaying latest serum creatinine results and providing access to renal dosing guidelines.

A retrospective chart review of approximately 200 patients will be done. Data collected will include patient age, indication for use, initial dose, titration dose, renal function, concomitant medications for the same indication, and use of alternative agents prior to use of gabapentin. Data collected prior to implementation will be compared to data post-implementation of the ordering changes in order to assess the impact on gabapentin usage. Conclusions will be presented at the Great Lakes Pharmacy Resident Conference.

### **Learning Objectives:**

To identify problems associated with prescribing gabapentin and its follow-up.

To determine if modification in ordering processes can improve the usage of gabapentin.

### **Self Assessment Questions:**

Gabapentin doses should be adjusted for patients with renal failure. T or F?

Gabapentin is FDA-approved for post-herpetic neuralgia. T or F?

## **EVALUATION OF VORICONAZOLE UTILIZATION PATTERNS IN A LARGE TEACHING HOSPITAL**

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Voriconazole is a second-generation triazole antifungal agent that gained FDA approval in 2002 for the treatment of invasive aspergillosis and *Scedosporium* and *Fusarium* species in patients intolerant of, or refractory to other antifungal therapies. Pharmacokinetic studies demonstrate that voriconazole is metabolized by CYP2C9, CYP3A4, and CYP2C19 liver isoenzymes. Consequently, voriconazole use is responsible for several drug-drug interactions and voriconazole-induced hepatitis. Because voriconazole is used in critically ill patients and may cause toxicities alone and in combination with other medications, patients receiving voriconazole therapy must be carefully monitored. The purpose of this medication use evaluation is to determine the appropriateness of voriconazole dosing and monitoring in a large teaching hospital.

This retrospective, observational, chart review study at the UWHC compared actual voriconazole utilization patterns to the UWHC's guidelines for voriconazole use. Patients were included in the study if they received at least one dose of oral or intravenous voriconazole from November 1, 2002 through April 1, 2003. Consecutive patients were identified from the pharmacy order entry database. Patient information was evaluated for proper dose and route of administration, valid indication, drug-drug interactions, and laboratory parameters specific to voriconazole therapy.

The results of the study will be presented.

### **Learning Objectives:**

Identify two parameters that must be monitored for all patients receiving intravenous voriconazole.

Describe the methods for calculating loading and maintenance doses for intravenous voriconazole and choose a proper oral dose based on patient specific parameters.

### **Self Assessment Questions:**

TRUE or FALSE? Voriconazole is indicated as a first line agent for all hospital acquired fungal infections.

TRUE or FALSE? Voriconazole is metabolized by CYP2C9, CYP3A4, and CYP2C19 liver enzymes and consequently has many clinically relevant drug-drug interactions.

## **WEEKLY DOSING OF ATORVASTATIN: IS EFFICACY MAINTAINED?**

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Purpose: HMG-CoA reductase inhibitors are used by millions of Americans to control cholesterol to goal levels established by the National Cholesterol Education Panel (III). Unfortunately, these medications are quite expensive and must be taken daily. The purpose of this study is to investigate if weekly dosing of atorvastatin 80mg is equal in efficacy to initial doses of drugs within this class.

Atorvastatin has a long half-life and active metabolites with half-lives of 11 to 57 hours. Atorvastatin is FDA approved for treatment of hypercholesterolemia at doses of 10 to 80mg daily.

If this proves to be an effective method for the dosing of atorvastatin, it will provide both increased convenience and compliance, along with a substantial cost savings to patients, insurers and the overall health system. The cost of atorvastatin 10mg daily is about \$60 for a one-month supply at retail pharmacies. Atorvastatin 80mg once a week would cost about \$15 a month, therefore leading to a cost savings of over \$500 annually per patient. Nationwide, the potential savings is phenomenal.

Methods: Patients who are currently at NCEP goal LDL levels while taking daily atorvastatin 10mg, simvastatin 20mg, pravastatin 40mg, lovastatin 80mg, or fluvastatin 80mg will receive atorvastatin 80mg weekly for 6 weeks. Baseline and end-of-study AST, ALT, and fasting lipid panels will be checked. A bi-weekly phone survey will be conducted to assess compliance and potential adverse reactions. Participants will be instructed not to change their dietary or exercise habits, and the weight of each patient will be recorded at the beginning and end of the study.

Results/Conclusion: The goal is to enroll a total of forty patients. Results and conclusions will be reported as they are obtained.

### **Learning Objectives:**

Explain why atorvastatin could potentially be dosed once a week.

List advantages of dosing atorvastatin weekly versus daily.

### **Self Assessment Questions:**

In this study, how long will the participants be taking atorvastatin weekly?

What laboratory values will be obtained at the beginning and end of the study?

## EPIDEMIOLOGY AND RISK FACTORS ASSOCIATED WITH NON-ALBICANS CANDIDEMIA IN NON-NEUTROPENIC PATIENTS

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The rising prevalence of *Candida* infections has been demonstrated in hospitalized patients. Effective empiric therapy for these infections can be complicated by the trend of increasing prevalence of non-albicans *Candida* spp. (NAC). Knowledge of risk factors for infections with NAC can provide guidance as to which patients should be considered for therapy targeted at more resistant species. The objective of this study is to evaluate the epidemiology and risk factors associated with NAC candidemia in the non-neutropenic host.

Microbiologic data was obtained for all blood cultures positive for *Candida* spp. from 1997-present. Patients with ANC < 500 will be excluded. Retrospective data collected from medical records includes demographics, prior medical history, antibiotic therapy, surgical procedures, medical devices, and clinical outcomes for each case. Statistical analyses will include univariate and multivariate analyses of risk factors and clinical outcomes.

Preliminary review identified 262 cultures positive for *Candida* spp. (152 *Candida albicans*, 47 *C. tropicalis*, 44 *C. parapsilosis*, and 16 *C. glabrata*.) Surgical patients accounted for 144 isolates; 72 of these from patients in the burn unit. The incidence of candidemia has decreased (n = 70, 1997; n = 24, 2001) while the prevalence of NAC has increased (37% 1997, 54% 2001). Predominant NAC species vary between patient care units. No cases of *C. glabrata* were observed prior to 2000, but this organism accounts for 26% of all isolates in 2002. Patients with NAC were older than those with *C. albicans*.

Patterns of *Candida* spp. responsible for candidemias are changing and vary with type of patient care unit. *C. albicans* remains the most common species isolated; however, it is now < 50% of all isolates at our institution. Further analyses of epidemiology and risk factors will be presented.

### Learning Objectives:

To evaluate the changing pattern of *Candida* spp. responsible for candidemia.

To identify risk factors for non-albicans *Candida* spp. for use in optimizing selection and dose of empiric antifungal treatment.

### Self Assessment Questions:

*Candida albicans* is the most commonly isolated species from non-neutropenic patients with candidemia. True or False  
All *Candida* spp. have similar susceptibilities to most antifungal medications. True or False

## EVALUATION OF THE EFFECT OF ENTERAL FEEDING ON THE BIOAVAILABILITY OF LINEZOLID

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Linezolid has been developed as an alternative treatment for multiresistant gram positive microorganisms. Critically ill patients who are likely to require linezolid treatment may be receiving concurrent enteral nutrition. Enteral nutrition, as well as critical illness, has the potential to decrease the bioavailability of orally administered medications. To date, the bioavailability of oral linezolid has not been studied in the presence of enteral feeds. The purpose of this randomized, crossover, controlled trial is to determine the relative bioavailability of linezolid in critically ill patients. Specifically the bioavailability of linezolid when administered to concurrently with enteral feedings will be compared to that achieved when linezolid is administered when enteral feedings are suspended for 1 hour prior to and 1 hour following drug administration.

Fourteen patients admitted to the University of Michigan Health System critical care medicine unit who meet the entry criteria and provide written, informed consent will be enrolled in this study. Study participants will receive two oral linezolid administration methods in random order: (a) linezolid 600 mg with uninterrupted enteral feedings and (b) linezolid 600 mg with suspended feedings. Blood samples will be drawn and pharmacokinetic parameters for both linezolid administration methods will be determined via noncompartmental analysis. The primary pharmacokinetic parameter to be evaluated is the area under the linezolid concentration versus time curve from zero to infinity (AUC). Secondary parameters include maximum concentration, time to maximum concentration, volume of distribution, oral clearance, elimination rate constant, and elimination half-life. The paired two-tailed Student's t-test will be used to compare AUC for each administration method.

Preliminary results will be reported.

### Learning Objectives:

Describe linezolid's bioavailability with concomitant enteral feeding.

Discuss the pharmacokinetics of linezolid in critically ill patients.

### Self Assessment Questions:

Linezolid is an antibiotic with activity against many multiresistant gram positive microorganisms.

- True
- False

Factors which may impact drug absorption in the critically ill patient include which of the following:

- Delayed gastric emptying
- Altered gastrointestinal pH
- Chelation of the drug by enteral feeds
- All of the above

## **DEVELOPMENT AND COMPLIANCE TO MEDICATION USE CRITERIA FOR NESIRITIDE USE AT A TERTIARY CARE INSTITUTE**

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Nesiritide is the first intravenous agent for the treatment of congestive heart failure to be FDA approved in over a decade. Natriuretic brain hormone (B-type) is produced by the ventricles of the heart in response to increased wall stress, hypertrophy and volume overload. Nesiritide is a recombinant human B-type natriuretic peptide that is identical to the endogenous hormone. Beneficial actions of this peptide are to cause a reduction in preload and afterload by producing venous, arterial and coronary vasodilatation, a non-inotropic mediated increase in cardiac output, and the suppression of both the renin-angiotensin-aldosterone system and sympathetic nervous system. Nesiritide is indicated for the treatment of patients with acutely decompensated congestive heart failure who will exhibit dyspnea at rest or with minimal activity. Treatment with this agent will improve symptomatic dyspnea but can also cause significant hypotension.

Pharmacy and Therapeutics Committee developed criteria for the use of nesiritide to improve patient outcomes and minimize side effects. The purpose of this study is to evaluate this institution's adherence to utilization guidelines for this agent.

Patients who received nesiritide from August 2002-February 2003 were included for evaluation. Patients were identified using pharmacy-billing reports. Charts were evaluated for: demographic information, left ventricular dysfunction with evidence of problematic elevated filling pressures, renal function at the initiation of therapy and at the end of therapy, documented failure with traditional treatment of CHF exacerbation, initial dose, dose titration, and the patient's systolic blood pressure, weight and fluid intakes and urinary output.

Data collection is currently ongoing with data analysis pending. Interpretation and results of this evaluation will be discussed with the cardiology prescribing group and the Pharmacy and Therapeutics Committee.

### **Learning Objectives:**

To learn dosing and monitoring of nesiritide as therapy for CHF exacerbation.

To discuss the developing role of nesiritide in the use of CHF.

### **Self Assessment Questions:**

It is recommended to decrease the dose of nesiritide or discontinue the drug if the patient's systolic blood pressure falls to less than 85mmHg. T or F

Dose titrations can be made every 30 minutes for desired effects. T or F

## **MEDICATION SAFETY IN WISCONSIN HOSPITALS: STATUS OF BEST PRACTICES AND BARRIERS TO IMPLEMENTATION**

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The Wisconsin Patient Safety Institute (WPSI), a collaboration of health care providers, professional organizations, consumer groups, state government, and other representatives, published ten medication safety recommendations in 2000. A survey of all Wisconsin hospitals (n=114) was conducted to assess changes in practice in Wisconsin hospitals since publication of the WPSI recommendations. Reminder postcards and a second survey were mailed after the initial mailing. On most questions, respondents were asked to compare their practice in 2000 to their current (2002) practice.

Usable surveys were returned from 76 hospitals for a response rate of 66.7%. Most hospitals were rural (63%) and had less than 100 beds. Wisconsin hospitals with pharmacy services available 24 hours a day increased from 75.3% in 2000 to 81.6% in 2002. Use of the unit dose system for 80% or more of non-emergency medications increased from 80.3% in 2000 to 93.4% in 2002. Only 5.4% of respondents had computerized provider order entry (CPOE) fully implemented in 2002, but 2.7% reported partial implementation and 64.9% planned to implement the technology. Common barriers to CPOE implementation included lack of financial resources and suitable systems. Only 2.6% of respondents had bar code systems for medication packaging and administration fully implemented in 2002, but 5.3% reported partial implementation and 52.6% planned to implement the technology. Barriers to implementation of bar code systems included lack of financial resources, other organizational priorities, and the absence of suitable systems.

Multidisciplinary review and promotion of medication safety standards has had a positive impact on pharmacy practice in Wisconsin hospitals. Although room for improvement exists, progress was observed in nearly all areas where WPSI made recommendations. In areas where data are available, including the use of unit dose and bar code technology for medication administration, Wisconsin hospitals surpass national benchmarks.

### **Learning Objectives:**

Describe the status of medication safety practices in Wisconsin hospitals.

Review barriers to implementation of technology such as CPOE and bar code systems.

### **Self Assessment Questions:**

Most Wisconsin hospitals plan to implement CPOE and bar code systems. T or F

Common barriers to CPOE and bar code system implementation include lack of financial resources and suitable systems. T or F

## **INTERVIEW SELECTION PROCESSES AND INTERVIEW SELECTION CRITERIA FOR PHARMACY PRACTICE RESIDENTS**

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**Background:** Currently, there are no guidelines established for pharmacists seeking postgraduate training including pharmacy practice residency. Last year, our institution surveyed pharmacy practice residency programs to determine whether or not a consensus exists in the selection criteria for future residents. The results of this survey revealed that personal interview was the highest ranked criterion in selecting pharmacy practice residents. Therefore, we decided to conduct a follow up survey to determine whether or not a consensus exists among residency programs in their criteria and technique for interviewing prospective pharmacy practice residents.

**Methodology:** A listing of accredited pharmacy practice residency programs was identified from the 2002-2003 American Society of Health-System Pharmacists (ASHP) online residency directory. In March 2003, contact persons for each of the 337 programs was emailed a 45-item questionnaire with instructions to rank each interview criteria or interview question on level of importance with 1 being the least important and 5 being the most important. Participants were also asked to complete a variety of questions including short answer and fill-in-the-blank. Individual identification of programs is kept confidential.

**Results:** The programs will be surveyed between March 3, 2003 and March 14, 2003. The results will be tabulated to determine the highest ranked criteria and questions most commonly asked during a pharmacy practice residency interview.

**Conclusions:** The results of this survey should provide insight into the interview process used to select a candidate for a pharmacy practice residency.

### **Learning Objectives:**

Evaluate the criteria used by pharmacy practice resident interview committees

Determine if a consistency exists among programs when interviewing prospective pharmacy practice residents

### **Self Assessment Questions:**

What are the similarities/differences in the criteria used by committees when interviewing pharmacy practice residency candidates?

Does a consensus exist among residency programs in their criteria and technique for interviewing prospective pharmacy practice residents?

## **COMPARISON OF CHRONIC DISEASE SCORES (CDS) AND MEDICATION-BASED SCORES (MBS) IN MEMBERS UTILIZING COX-2 INHIBITORS AND NSAIDS FROM A PHARMACY BENEFITS MANAGEMENT SETTING**

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The purpose of the study was to determine if members identified in a pharmacy claims database as chronic COX-2 Inhibitor utilizers attain a higher Chronic Disease Score (CDS) compared to chronic NSAID utilizers. In addition, CDS was compared to medication-based scores (MBS) to evaluate the validity of the scoring tool.

This study was a retrospective claims database analysis conducted in order to identify members who had received at least 90 consecutive days of COX-2 Inhibitor or NSAID prescriptions (defined as chronic utilizers) between 7/01/01 and 7/01/02. Chronic utilizers who were identified as having a 30 day period of prior COX-2 Inhibitor or NSAID prescription use were not included in the study. Members were evaluated by using a Chronic Disease Score (CDS) instrument, which determined each member's chronic disease status based on empirically-derived weights from prescription utilization, age, and gender. The CDS analysis was compared to MBS, which were determined by counting the number of unique prescriptions for each member.

427 COX-2 Inhibitor and 131 NSAID chronic utilizers were identified for the CDS and medication-based score analysis. Pharmacy claims analysis will be presented.

### **Learning Objectives:**

Determine the Chronic Disease Score (CDS) and medication-based score (MBS) from pharmacy claims data.

Determine the validity of the CDS instrument as a scoring tool.

### **Self Assessment Questions:**

The CDS instrument is a reliable predictor of co-morbidity in claims database research. T or F?

2. A co-morbidity instrument associated with pharmacy claims data is a useful tool for risk adjustment in retrospective drug utilization review (RDUR). T or F?

## **VITAMIN D AND SKELETAL HEALTH IN OLDER VETERANS RECEIVING CARBAMAZEPINE OR PHENYTOIN**

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Effects of long-term enzyme-inducing antiepileptic drug therapy on vitamin D status of older men have not been well studied. Use of enzyme-inducing antiepileptic drugs has been associated with altered vitamin D metabolism leading to vitamin D inadequacy. Vitamin D insufficiency weakens bones, impairs muscle strength, and predisposes to fracture. This study will assess the need for and efficacy of oral vitamin D supplementation (50,000 IU/month) in older veterans receiving monotherapy with either of the enzyme-inducing antiepileptic drugs carbamazepine or phenytoin.

This is a prospective open-label 12 month study of the effect of monthly treatment with oral vitamin D 50,000 IU on vitamin D status and bone density. Subjects will be recruited from the Madison VA Neurology Clinic patient population. We plan to recruit 35 subjects, for whom 30 are anticipated to finish the study. Inclusion criteria include age >50 years, receiving carbamazepine or phenytoin monotherapy for epilepsy, and willingness to provide written informed consent. Exclusion criteria include other conditions likely to affect skeletal status, including hepatic or renal dysfunction, metastatic malignancy, and primary hyperparathyroidism. Subjects will fill out an initial questionnaire, undergo bone density testing (central DXA), and baseline labs (intact PTH, 25-OH vitamin D, serum alkaline phosphatase, total serum calcium, serum creatinine, albumin). Subjects will undergo follow up laboratory assessment at 6 and 12 months, and follow up bone density and Exit Questionnaire at 12 months. Subjects who qualify for treatment for osteoporosis will be offered a referral to the VAMC Osteoporosis Clinic.

Data collection ongoing with preliminary results to be presented. It is our expectation that older veterans will exhibit vitamin D insufficiency and that monthly vitamin D supplementation will provide a convenient, widely applicable intervention to achieve optimal 25-OH vitamin D levels.

### **Learning Objectives:**

Name the enzyme inducing antiepileptic drugs that have been linked to vitamin D deficiency.

Identify measures that your institution could implement to improve and optimize bone health screening and prevention in patients receiving enzyme inducing antiepileptic drugs.

### **Self Assessment Questions:**

What is the target level for 25-OH vitamin D? How do you determine the optimal dosing for vitamin D supplementation?

What are the possible side effects with vitamin D supplementation? Does supplementation require any monitoring for safety and/or efficacy?

## **EVALUATION OF PHYSICIAN ADHERENCE TO A COMPUTERIZED PATHWAY FOR THE OUTPATIENT USE OF ENOXAPARIN**

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The use of LMWH (low molecular weight heparin) has been shown to be efficacious and safe in the outpatient management of anticoagulation. Advantages of LMWH over unfractionated heparin include better bioavailability, longer half-life, dose-dependent clearance, and better predictability. Previous studies with strict patient selection have shown that outpatient anticoagulation with LMWH and warfarin is safe and effective and allows for reduced hospital stay. At the Veteran's Healthcare Administration of Cincinnati, (VHACIN), a clinical pathway outlining objective patient criteria for the outpatient use of enoxaparin was implemented in March 2003.

A retrospective chart review was conducted on patients receiving outpatient prescriptions for enoxaparin between January 1, 2002 and March 30, 2003. Subjects included outpatients that were started on treatment with enoxaparin following a diagnosis of DVT or patients that required LMWH, as bridge therapy with warfarin, to achieve anticoagulation. The primary outcome assessed is physician adherence to the protocol. Secondary outcomes assessed include number of days of hospital stay on enoxaparin, incidence of adverse effects, and time to therapeutic INR. These outcomes will be compared in patients receiving enoxaparin pre- and post-pathway implementation. To date, a total of 60 patients have been identified and data collection is ongoing.

### **Learning Objectives:**

To review the current recommendations for the outpatient use of enoxaparin.

To describe an outpatient pathway for the use of enoxaparin at this institution.

### **Self Assessment Questions:**

In studies, LMWH has been shown to be as safe and efficacious as unfractionated heparin. T or F

It is possible that certain patients diagnosed with a DVT can be treated at home without ever being admitted to the hospital. T or F

## **RENAL AND CARDIOVASCULAR EFFECTS OF COX-2 INHIBITORS VS NSAIDS IN A VA POPULATION: A RETROSPECTIVE STUDY**

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### **OBJECTIVE:**

- 1.) To determine if the renal effects of cyclooxygenase-2 (COX-2) inhibitors are comparable to nonsteroidal anti-inflammatory drugs (NSAIDs) in a VA population.
- 2.) To determine if the cardiovascular effects of cyclooxygenase-2 (COX-2) inhibitors are comparable to nonsteroidal anti-inflammatory drugs (NSAIDs) in a VA population.

### **RESEARCH DESIGN:**

In order to provide clarity to this ongoing controversy, this retrospective study will analyze the renal and cardiovascular effects of COX-2 inhibitors versus NSAIDs. The population consists of patients at the North Chicago Veteran Affairs Medical Center (NCVAMC) who have received COX-2 inhibitors or selected NSAIDs within the last three years. Patients will be identified through pharmacy medication refill records and laboratory data. Patients will be selected based on inclusion and exclusion criteria provided in the protocol.

### **METHOD:**

Data from two hundred and fifty patients will be collected via the NCVAMC computer database. Patients will be randomly selected and placed in to one of the following groups: Rofecoxib, Celecoxib, Ibuprofen, (Etorolac) and Salsalate. Patients will be assessed for changes in creatinine clearance, pulse, blood pressure, weight, and serum electrolytes from baseline. In addition, the incidence of cardiovascular events such as MI and symptoms of CHF will also be monitored. These parameters will be evaluated quarterly for one year. Medication compliance will be assessed monthly via refill records and progress notes.

### **CLINICAL RELEVANCE:**

The purpose of this study is to compare the renal and cardiovascular effects of COX-2 inhibitors versus NSAIDs in this patient population. Both COX-2 inhibitors celecoxib and Rofecoxib will also be studied. This study is relevant because most of the people receiving COX-2 inhibitors in this subset of population are older, and are at increased risk of cardiovascular and renal events. COX-2 inhibitors are not on the formulary and their use is restricted to patients meeting criteria.

### **STATISTICAL DESIGN:**

Data will be collected and analyzed. Results will be presented at the Great Lakes Residency Conference April 2003.

### **Learning Objectives:**

To assess if the renal/cardiovascular effects of cyclooxygenase-2 (COX-2) inhibitors are comparable to nonsteroidal anti-inflammatory drugs (NSAIDs).

To determine the appropriate patient population for the use of NSAIDs and Cox-2 inhibitors.

### **Self Assessment Questions:**

The primary mechanism of action for all NSAIDs is the inhibition of two cyclooxygenase isoenzymes COX-1 and COX-2. T or F

Most of the patients experienced increased blood pressure with the use of a cyclooxygenase-2 (COX-2) inhibitor T or F

## **PHARMACIST SCREENING OF ATYPICAL ANTIPSYCHOTIC-INDUCED DYSLIPIDEMIA IN AN OUTPATIENT PSYCHIATRIC VA SETTING**

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A number of case reports have been published discussing the incidence of dyslipidemia, hyperglycemia, and weight gain associated with the use of atypical antipsychotic agents. These agents include clozapine, olanzapine, quetiapine, risperidone, and ziprasidone. There appears to be a correlation between the metabolic effects and the agents, however the mechanism is unknown. Possible theories include antihistaminic properties of the agents, leptin resistance, and serotonin antagonism at the 5HT<sub>2C</sub> receptor. The association of atypicals and metabolic complications has not been confirmed in epidemiological studies, or documented within the outpatient psychiatric setting. The purpose of this study is to describe the metabolic effects of atypicals on our outpatient VA population. The secondary objective is to assess the current method of screening for the metabolic complications associated with the use of the atypical antipsychotics in the outpatient VA population, particularly dyslipidemia.

A list of patients receiving atypical antipsychotic agents from 12/1/02- 2/15/03 will be obtained. From this list, 100 patients will be randomly selected. Each patient's medical record will be evaluated for the presence of CHD risk factors as defined by NCEP ATP-III guidelines, diabetes, weight, and a baseline fasting lipid panel. For patients with dyslipidemia, the use of lipid-lowering agents as well as the monitoring involved with the use of these agents will be assessed. These data will be compiled to document the incidence of atypical antipsychotic induced dyslipidemia in the outpatient setting and to determine the current system of screening and management of atypical-antipsychotic-induced dyslipidemia, diabetes and weight gain. Data will then be used to formulate a systematic approach of screening for these complications in this patient population.

The implication of this study is to use the data obtained to set up a system of screening and management for dyslipidemia, diabetes and weight gain in the VA's outpatient psychiatric setting.

### **Learning Objectives:**

To gain an understanding of the importance of screening for dyslipidemia, as well as the importance of monitoring weight and glucose.

To assess the current system of screening and management of the metabolic complications at the outpatient VA psychiatric setting.

### **Self Assessment Questions:**

Atypical antipsychotics are associated with a higher incidence of weight gain and dyslipidemia than typical antipsychotics. T or F

There is a set of guidelines for management of atypical antipsychotic-induced dyslipidemia, weight gain and hyperglycemia. T or F



## **CARDIOVASCULAR RISK REDUCTION STRATEGIES IN A COMMUNITY HOSPITAL**

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Despite the availability of proven therapies for the secondary prevention of coronary heart disease (CHD), they remain underutilized. Twenty-three percent of patients with a diagnosis of myocardial infarction (MI) were discharged without aspirin and 63% without statin treatment from July 1999 to June 2000 according to the National Registry of Myocardial Infarction. In addition, 35% of patients were discharged without beta-blockers and 58% without an ACE-inhibitor.

The Risk Evaluation in Action for Cardiac Health (REACH) program was established at Advocate Lutheran General Hospital to help increase the recognition of patients who may benefit from strategies directed at secondary cardiac risk reduction. When physicians obtain their daily census on the hospital computers, patients who meet predefined criteria for benefiting from cardiac risk reduction therapies, are electronically "flagged" with a heart shaped icon next to their name. When the heart icon is tapped the physician is directed to a web-based screen that contains national guidelines (i.e. NCEP ATP III), dosing recommendations, and also patient specific diagnoses or lab data which triggered the patient into the REACH program. Physicians have the ability to access the current medication orders in the pharmacy order entry system.

The primary objective of this study was to determine if the REACH program has resulted in an increase in the utilization of medications for secondary risk reduction. A subgroup analysis of the impact of this program was performed in diabetic patients in addition to an analysis to determine if all patients who met criteria for secondary prevention are in fact being enrolled into the REACH program.

### **Learning Objectives:**

To become familiar with current prescribing patterns for secondary cardiovascular risk reduction medications for patients who may benefit from these medications.

To learn one method of increasing the recognition of patients who may benefit from strategies directed at secondary cardiac risk reduction.

### **Self Assessment Questions:**

There was an increase in the utilization of secondary cardiovascular risk reduction medications after the implementation of the REACH program. T or F

The majority of patients who may benefit from secondary cardiovascular risk reduction medications are being enrolled into the REACH program. T or F

## **IMPLEMENTATION OF A CLINICAL INTERVENTION PROGRAM**

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The Department of Pharmacy for Riverside Methodist Hospital consists of over twenty clinical pharmacists and residents. Their primary focus is to monitor the use of high-risk medications, high-cost medications, and antibiotics. The pharmacists use four different programs and/or reports to help them perform their daily activities. The Department of Pharmacy has recently acquired a clinical intervention program that has the capabilities of performing the same functions as the four programs/reports combined.

TheraTrac II© is a new clinical intervention program that was designed to broaden the capabilities of individual practitioners to more closely monitor a larger group of patients. The program consists of a database of the entire patient population within the institution and is directly linked to the HBOC© Star hospital information system. The database is continuously updated as transactions are processed in the hospital information system. The objectives of the clinical intervention program are achieved through the building of alarms to filter the data into manageable results.

Implementing the new program into the daily workflow of the clinical pharmacists involved several months of training and experimentation. The initial months consisted of training sessions and were designed to allow the pharmacists to gradually incorporate this program into their daily activities. This implementation period permitted the opportunity to build alarms for desired therapeutic monitoring in conjunction with current practice methods.

Upon completion of the implementation phase, a study will be performed to monitor the use and benefits of the program by the members of the pharmacy department. Focus areas will include application of the program into daily practice patterns, intervention rates, intervention times, economic analyses, medication safety analyses, and an assessment of the therapeutic outcomes from the program.

### **Learning Objectives:**

The audience will learn the capabilities of the new clinical intervention program.

The audience will understand how the technology will be incorporated into the daily routines of clinical pharmacists.

### **Self Assessment Questions:**

A clinical intervention program is a new technology that is linked to a hospital information system, laboratory system, and order entry system within an institution and is capable of monitoring all patients entered into the systems for potentially inappropriate drug therapy. True or False

TheraTrac II was designed to increase the number of patients that each pharmacist can monitor for inappropriate drug therapy in a more efficient manner. True or False

## EVALUATION OF AN INTENSIVE INSULIN PROTOCOL IN THE CRITICALLY ILL

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**Background:** Stress hyperglycemia occurs commonly in the critically ill and is the result of a series of complex disorders that affect the ICU patients. The known deleterious effects of hyperglycemia can be minimized by maintaining normoglycemia. An intensive insulin infusion protocol was developed to improve glycemic control in the ICU patients, which is standard of care in the MICU, CICU and HFICU at the Cleveland Clinic Foundation.

**Objectives:** This is a prospective observational study with the primary objective to evaluate the effectiveness of the intensive insulin infusion protocol in the MICU, CICU and HFICU.

Secondary objectives include incidence of hypoglycemia, healthcare provider adherence with the protocol, and description of patient population enrolled in the study.

**Methods:** The insulin protocol is initiated when a patient has four consecutive measurements over 150 mg/dL after failure of sliding scale insulin treatment. Target blood glucose range is 70 - 115 mg/dL. The protocol describes specific instructions on administering boluses, adjusting rates of infusion according to blood glucose readings, and adjusting rates of infusion based on enteral or total parenteral nutrition. Data collected consists of time to reach target glucose levels, readings within, above and below target range. Adherence with the protocol will be assessed from the time a patient is started on the insulin infusion until 24 hours after the first reading within the target glucose range.

**Results:** Data will be analyzed to determine mean and median time to reach target glucose levels, percentage of time within, above, and below target glucose range, and area under the glucose concentration curve for 24 hours from the first reading within the target glucose range. Adherence and incidence of hypoglycemia will be analyzed over the same period time period. Preliminary results will be presented.

### Learning Objectives:

Describe the importance of intensive insulin control in the critically ill patients.

Summarize the preliminary results of evaluating the intensive insulin protocol in the MICU, CICU, and HFICU at the Cleveland Clinic Foundation.

### Self Assessment Questions:

Intensive insulin therapy resulted in decreased ICU mortality and hospital mortality in the Van den Berghe trial.

- a. T
- b. F

The insulin protocol being evaluated does not give specific instructions on adjusting the insulin infusion rate according to nutritional changes.

- a. T
- b. F

## ETIOLOGY AND TREATMENT OF EARLY FEVER IN TRAUMA PATIENTS

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Fever is a well-recognized event in post-operative and post-trauma patients. Evaluation of new fever in a critically ill patient can incur substantial resources. While fever can indicate an infectious process, there are numerous non-infectious causes in this patient population. However, the exact incidence of noninfectious fever is not known and is poorly described. The objective of this study is to differentiate the etiology of early (within five days of admission) fever in trauma patients.

A retrospective evaluation of patients admitted to the trauma service in the year 2002 was performed. Initial patient identification was performed by reviewing patient admissions from a trauma patient registry. Patients were excluded if they were less than 18 years of age, transferred from an extended care facility or outside hospital, or had underlying immunosuppression. Microbial cultures for all eligible patients were reviewed via computer database. Patients with cultures obtained within the first five days of admission were included. Chart review was performed to associate timing of temperature elevations with cultures. Demographic data and Injury Severity Score were noted. Etiology of early fever was documented in each patient. Positive cultures from blood, sputum, and urine were reviewed to delineate the most prominent sources and organisms causing early infectious fevers. The proportion of patients treated with antimicrobial therapy was documented. Identification of the most common etiology of fever following trauma will allow judicious use of resources for fever evaluation and empiric antimicrobial use.

### Learning Objectives:

Evaluate the most common etiology of early fever following trauma.

Quantify and describe the utility of early cultures in early post-traumatic fever.

### Self Assessment Questions:

Early fever in critically ill patients following trauma is always a manifestation of an infectious process.

T or F

Blood cultures should be obtained in all critically ill post-trauma patients with early fever.

T or F

## **ASSESSING A UNIVERSITY AMBULATORY CLINIC'S INFLUENZA VACCINATION RATES AND THE NEED FOR A PHARMACY BASED IMMUNIZATION PROGRAM**

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### **Background:**

Every year in the United States approximately 36,000 people die of influenza, and there are a countless number of deaths that are triggered by this infection. In Cook County, only 30% of Medicare patients were vaccinated in the 2000-2001 influenza season. This is below the Healthy People's goal of 60% for the year 2000.

### **Purpose:**

This study's purpose is to evaluate the extent to which the outpatient pharmacy's high-risk patient population has been vaccinated for the 2002-2003 influenza season. Additionally, an assessment can then be made about the need for a pharmacy based immunization program.

### **Methods:**

Using the UIC PharmServ computer system, a printout will be generated listing all persons who are high-risk for the influenza virus and visited the outpatient pharmacy between October 1, 2002 and January 31, 2003. High-risk patients will be defined by their medication profiles found in PharmServ.

Next, a data collection sheet will be created. The form contains information regarding patients' influenza vaccination status: the primary clinic they visited, if they were seen by the medicine clinic during influenza vaccination season, influenza vaccination status for the 2002-2003 season, and what month they received the vaccination. This information will be evaluated by comparing our outpatient pharmacy's influenza vaccination rate to Cook County's and to the goal rate set by Healthy People.

Patients will not be contacted for purposes of this study. All information about vaccination status will be collected from the university's electronic medical database, Gemini. If there is no record of vaccination administration either on the flowsheet or in patient notes between October 1, 2003 and January 31, 2003, it will be assumed that a vaccination was not received. No patient will be excluded from the study once he or she meets the inclusion criteria and are deemed high-risk for the influenza virus.

Results/Conclusion: pending.

### **Learning Objectives:**

To retrospectively evaluate each high-risk patient, who is a customer of the outpatient pharmacy, for his or her influenza vaccination status. More specifically:

- Did the patient get immunized this season?
- During what month did they receive their immunization?
- Where did they receive their vaccination?

To determine a need for a pharmacy based immunization program based on our patient populations rate of immunization.

### **Self Assessment Questions:**

What groups of patients are at high-risk for influenza virus?

What is the Healthy People's goal influenza immunization rate for the year 2010?

## **AN ANALYSIS OF THE COST SAVINGS ACHIEVED THROUGH THE PROCUREMENT OF PALIVIZUMAB, AN EXPENSIVE INJECTABLE, VIA SPECIALTY DISTRIBUTION IN A LARGE HEALTH PLAN.**

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Methods: Prescription drug claims for palivizumab, from a health plan with 6.6 million HMO and PPO members, were retrieved utilizing retail pharmacy, medical benefit, and mail order databases for cost comparison with claims retrieved from its specialty distributor. Respiratory Syncytial Virus (RSV) season 2002 (October 2002 - April 2003) marked the first year this health plan initiated a national initiative of palivizumab procurement via specialty distribution. Plan members with any health coverage plan received palivizumab as a medical benefit, resulting in a zero dollar copay. Paid medical benefit and retail claims for palivizumab were retrieved from dates October 1, 2001- April 30, 2002; mail order claims from January 1, 2002 - April 30, 2002 and specialty claims were pulled from October 1, 2002 - April 30, 2002. Cost per script savings was determined by evaluating palivizumab claims paid for retail, medical benefit and mail order (pre-national initiative) compared to paid specialty pharmacy claims (post-national initiative).

Results: It was determined that palivizumab procurement via specialty distribution yielded cost-savings. Cost per script savings (CPSS) was 47% for patients receiving palivizumab through specialty rather than retail; Specialty distribution CPSS was 46% less than medical benefit acquisition and 13% less than mail order. The potential yearly cost savings to the plan by utilizing specialty over retail was \$498,973; when utilizing specialty over medical benefit and mail order the potential yearly cost savings was \$71,855 and \$49,995, respectively.

Conclusions: A large health plan achieved considerable cost savings by instituting a national initiative of palivizumab procurement through specialty distribution. In addition, the specialty distributor assumed responsibility for care management, shipping and storage. The health plan receives monthly informative reporting on all injectables dispensed. Utilizing specialty distribution for the procurement of an expensive injectable can help to decrease cost and maximize care management in a large health plan.

### **Learning Objectives:**

Audience participants will understand the benefits associated with a health plan establishing a contract with a specialty distributor for the cost-effective procurement of an expensive injectable

Audience participants will evaluate the prudent use of palivizumab, an expensive injectable, in infants at high risk for respiratory syncytial virus (RSV)

### **Self Assessment Questions:**

Synagis (palivizumab) is indicated for treatment of patients at high risk for RSV. Once infected, RSV patients are at risk for: A. Pneumonia, B. Bronchiolitis, C. Influenza, D. A and B, E. A, B and C

Answer D

Specialty pharmacy distribution for palivizumab provides all of the following for a large health plan, except:

A. Care Management, B. Storage, C. Shipping, D. Administration, E. Data collection

Answer D

## VANCOMYCIN USE IN PEDIATRIC PATIENTS

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**Purpose:** To evaluate the appropriateness of vancomycin use in pediatric patients after provision of physician education regarding judicious use of vancomycin.

**Methods:** A prospective chart review was conducted from September through December 2002. We reviewed all patients receiving vancomycin, from all areas of our 151-bed children's hospital. Criteria for appropriate use were based on the guidelines from the Hospital Infection Control Practices Advisory Committee of the Centers for Disease Control and Prevention (CDC), and were approved by the hospital's Pharmacy and Therapeutics Committee. Data analysis was performed by using a Microsoft Excel database.

**Results:** Fifty-three (53) courses were assessed. Vancomycin use met the criteria in 52 courses (98%). One course did not meet the CDC recommendations due to continuation of empiric vancomycin use when cultures were negative for beta-lactam-resistant Gram-positive bacteria. Both oral and intravenous routes of administration were included, with a length of treatment ranging from 1 to 14 days. The most frequent use of vancomycin was seen in general pediatric (39.6%) and neonatal intensive care unit patients (37.7%).

**Conclusion:** There was 98% compliance with the CDC guidelines for prudent vancomycin use in all areas of the hospital. This observation may be attributed to interventions and staff education provided by the hospital's pediatric and neonatal clinical pharmacy specialists.

### Learning Objectives:

Discuss risk factors for vancomycin-resistant Enterococci (VRE) emergence and strategies used to prevent VRE incidence in pediatric patients.

Describe appropriate indications for vancomycin use in pediatric patients according to the Centers for Disease Control and Prevention.

### Self Assessment Questions:

The following statements are in agreement with approaches used to avoid the emergence of VRE in pediatric patients, EXCEPT:

- Minimize the number of surveillance cultures.
- Provide educational programs that include hospital staff and families.
- Implement appropriate antibiotic use practices.
- Implement strict isolation procedures of patients colonized with VRE.

Which of the following would be considered as compliant with the CDC recommendations for prudent vancomycin use?

- Patients with serious allergy to beta-lactam antibiotics who are being treated for infection with gram-positive bacteria.
- First-line treatment for Clostridium difficile colitis.
- Empiric therapy for all neutropenic patients.

- I only
- II only
- I and II
- II and III
- I, II, and III

## PHARMACOKINETICS OF TOPIRAMATE ADMINISTERED INTRAGASTRICALLY VERSUS RECTALLY IN CRITICALLY ILL PATIENTS.

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In critically ill patients, seizures commonly occur following structural brain injuries. In addition, refractory general convulsive status epilepticus also occurs in critically ill patients. However, in this patient population, oral medication administration may be a barrier. Topiramate, a desirable antiepileptic drug (AED), is available only in the oral dosage form. The potential benefit of safely obtaining rapid therapeutic concentrations via either the rectal and oral route is the addition of an alternative drug to the armamentarium of AED's for acute use in the critically ill. In order to adequately assess an alternative route of administration, evaluation of the pharmacokinetic profile is essential. The objective of this study is to evaluate the pharmacokinetic profile ( $K_e$ ,  $C_{max}$ ,  $T_{max}$ ,  $AUC_{24}$ ) of topiramate following either rectal or intragastric administration in critically ill patients and describe adverse events associated with either administration route. This prospective, open-label study randomized 20 patients to receive topiramate 400mg dose either rectally (n=10) or intragastrically (n=10). All adult patients admitted to Detroit Receiving Hospital were included if they had a seizure diagnosis or were at high risk of developing seizures, had an informed consent obtained, and were able to receive medications either orally or rectally. Patients were excluded if they were taking more than one AED excluding gabapentin or levetiracetam, were hypersensitive to topiramate, were pregnant, had a  $CrCl < 70$  ml/min, or were currently taking topiramate. Serial blood draws for pharmacokinetic analysis occurred at predetermined time intervals following topiramate administration. Appropriate statistical tests were performed. Results to be presented.

### Learning Objectives:

To identify the importance of various routes of medication administration in critically ill patients.

To evaluate the pharmacokinetic profile of rectal versus intragastric topiramate administration in critically ill patients.

### Self Assessment Questions:

Topiramate has been shown to be absorbed rectally when administered to healthy volunteers and in a case report of one critically ill patient. T or F

Rectal administration of topiramate may be an alternative form of administration in critically ill patients. T or F

## EVALUATION OF THE CORRELATION OF CYCLOSPORINE LEVELS BETWEEN C0 AND C2 IN ORTHOTOPIC HEART TRANSPLANT PATIENTS

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Recent evidence suggests that the most sensitive marker for the extent and consistency of cyclosporine (Neoral®) (CsA) exposure exists within the absorption phase (1st 4hrs after administration) in the individual transplant recipient. Specifically, measurement of Neoral® CsA levels 2-hours post dose (C2) more accurately reflect the AUC and have shown correlation to the presence or absence of early rejection. While there is published data on C2 levels in the kidney and liver population, there is a lack of published data within the heart transplant population. Therefore, this study involves evaluation of C2/C0 levels in the St. Vincent heart transplant population that is receiving Neoral® and is less than 5 years post transplant. The goal is to determine appropriate target C2 levels in this population and to examine overall patient variability in cyclosporine concentrations between C2 and C0.

**Design/Methods:** The current St. Vincent heart transplant population consists of 36 patients receiving Neoral® who are less than 5 years post transplant. This population will be divided into the following patient groups delineated by time post transplant of 0-3, 3-6, 6-12, 12-24, and 24-60 months. Patients whose serum creatinine is  $\leq 2$  mg/dl pre-transplant or  $\leq 2$  mg/dl post transplant will be included as separate groups in the analysis. For statistical strength, it was determined that eighty-four C2/C0 levels are needed for evaluation, consisting of 12 C2/C0 levels per patient group.

**Results:** At this time, the study is still in development with data collection to start as soon as funding is finalized. Once data is collected, it will be analyzed by the study group for correlation and variability. Appropriate C2 levels will be determined using correlation to current target C0 levels for the St. Vincent heart transplant population.

### Learning Objectives:

Define/delineate the pharmacokinetic differences between cyclosporine trough levels and cyclosporine 2 hour levels  
Discuss the process of obtaining cyclosporine 2 hour levels

### Self Assessment Questions:

Cyclosporine 2 hour levels have been validated in patients on Neoral®  
True or False  
Cyclosporine 2 hour levels can be drawn 2 hours  $\pm$  30 minutes after a dose  
True or False

## INFECTION PATTERNS IN LIVER TRANSPLANT RECIPIENTS: A 14-YEAR ANALYSIS

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Infections are associated with considerable morbidity and mortality in liver transplant (LT) recipients which threaten the overall success of graft and patient survival. It is suspected that the incidence of certain infections may be declining with the advances in operative techniques and use of effective anti-microbial prophylaxis. Previous data has suggested infections are most likely to occur within the first 6 months post-transplantation. The objective of this study is to determine the patterns of various microorganisms in LT recipients. A retrospective analysis was conducted of all LT recipients at our institution between September 1988 to July 2002. Patient in-hospital and out-patient charts, flow sheets and computerized microbiology records were reviewed. This data was utilized to determine patterns of developing bacterial, viral and fungal infections in regards to, history of hospitalization prior to transplant, immunosuppression regimen used, rejection episodes and time from LT to infection. Two hundred fifty-three patients were evaluated, of which, 61.3% were male. One hundred eighty-two patients developed some type of infection. Their mean hospital length of stay was  $23.9 \pm 16.2$  days and 29.8% were hospitalized pre-transplantation. Throughout the 14-year period there were a total of 691 bacterial, 80 viral and 76 fungal infections. The probability of acquiring bacterial infections within the first month was 30.6% (95% CI, 0.249-0.363); at 2 years bacterial infections were seen in 51% of patients (95% CI, 0.440-0.569). Viral infections occurred in 1.6% of patients at 1 month and increased to 17.1% at 2 years. Fungal infections occurred in 4.8% and 14% of patients at 1 month and 2 years, respectively. There was a marginal increase in the rate of viral infections in patients who developed allograft rejections ( $P=0.061$ ). These results suggest spectrum and onset of infections may be shifting as patient's clinical characteristics change, immunosuppression regimens evolve and multi-resistant organisms emerge.

### Learning Objectives:

Discuss the development of various infections in liver transplant patients.  
Describe factors associated with the development of infections in LT recipients.

### Self Assessment Questions:

There may be an increase rate of viral infections in LT patients who develop rejection.  
True or False.  
Which type of infection may be seen more often in LT recipients?  
a) viral  
b) fungal  
c) bacterial  
d) None of the above because LT patients do not get infections.

## **REIMBURSEMENT FOR PHARMACIST PROVIDED COGNITIVE SERVICES IN AMBULATORY SETTINGS**

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Our ambulatory pharmacists provide physician and patient education, product use demonstration, drug therapy monitoring, drug utilization review, disease and wellness management in both pharmacist managed clinics and outpatient pharmacies. Wisconsin Medicaid provides reimbursement for many of these services; most third parties do not offer reimbursement. Our pharmacists were surveyed to identify the cognitive services provided in a primary care clinic, a specialty clinic, and in our outpatient pharmacies. This survey identified 4 primary services including the identification of adverse drug interactions, incorrect dosages, unnecessary drug therapies, and patient education. A review of services currently receiving reimbursement included services such as the identification of late refills, therapeutic duplications, and alternative product selection opportunities. The Wisconsin Medicaid guidelines and procedures were also thoroughly reviewed to identify additional opportunities for reimbursement, and required information for documentation. Several tools were used to remind pharmacists to submit claims for reimbursement and to simplify the process. The tools used included templates to assist with documentation, reminder notes by each workstation, and discussions during monthly staff meetings. A goal was set for each pharmacist to submit 1 claim per week. For the services provided in our pharmacist managed clinics, the Medicare criteria for reimbursement for evaluation and management of a patient were reviewed. The criteria were then applied to our services to identify potential opportunities for reimbursement. Development of strategies to maximize reimbursement for pharmacist provided cognitive services is vital to our future.

### **Learning Objectives:**

Define cognitive services.

Identify tools for maximizing reimbursement for cognitive services.

### **Self Assessment Questions:**

What is the definition of cognitive services?

What are some tools to increase pharmacists' awareness for maximizing reimbursements for cognitive services?

## **NATIONAL SURVEY OF HOSPITAL PHARMACISTS QUALITY OF WORK LIFE**

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Hospitals face both an immediate need for caregivers and an even more threatening long-term shortage of qualified workers. This shortage reflects growing demand, shifting demographics, a change in career expectations and attitudes about work, and worker dissatisfaction within healthcare. In 2001, the hospital vacancy rate for pharmacists was 12.7%. The fundamental workforce issue in the healthcare field is job satisfaction. The environment in which we work and the perspective's of the employee influences job satisfaction. Employee characteristics and their general outlook on life (locus of control) play an integral role in job satisfaction.

Using standardized measures of job satisfaction this research will establish current levels of hospital pharmacists' job satisfaction in the current healthcare environment. In-order to avoid any validation problems, this study used standardized measures of job satisfaction and work locus of control scales. A standardized measure of work locus of control will assess the degree to which a person views reinforcements in the workplace as a result of personal effort (internal locus of control) or whether outcomes happen as a result of luck, fate, or powerful others (external locus of control).

Results of the survey are forthcoming. The study will determine the extent to which the employee's attitude toward their job and response to the work environment contribute to job satisfaction. The data will help managers understand the characteristics of pharmacists with higher job satisfaction, as well as identify motivating factors that keep pharmacists satisfied in their job. Ultimately, this research will enable managers to understand the factors that promote satisfaction and can be used to match employee desires with appropriate job functions. These factors can lead to improved job matches, increased satisfaction, and decreased employee turnover.

### **Learning Objectives:**

To determine the current level of job satisfaction among hospital pharmacists.

To identify characteristics of satisfied hospital pharmacists.

### **Self Assessment Questions:**

The environment in which we work and the perspective's of the employee influences job satisfaction. T or F

Individuals who view reinforcements in the workplace as a result of personal effort (internal locus of control) report higher job satisfaction. T or F

## **MEDICATION ADHERENCE IN LATINOS WITH TYPE 2 DIABETES MELLITUS**

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### **Introduction:**

Diabetes mellitus is a chronic disease that affects nearly 16 million people in the USA, 95% of which have type 2 diabetes mellitus. Overall, Latinos are about two to three times more likely to develop type 2 diabetes than non-Latino whites and diabetic complications are higher in Latinos leading to increased hospitalizations and earlier death. Many of the diabetic complications may be avoided by adhering to special diet, regular exercise and appropriate use of prescribed medications.

Medication adherence in the general population is estimated to be 50% at best and declines when barriers are present. Lack of understanding the disease and common language are both factors that contribute to a patient's non-adherence. Couple that with complex directions written in English or Spanish and non-adherence increases even further.

The aim of the study is to determine the level of non-adherence to diabetic medications and to identify cultural-specific barriers to adherence in the Latino population at the Wingra Family Medical Center in Madison, Wisconsin.

### **Methods:**

Patients were selected from the Wingra Family Medical Center population based on ICD-9 codes that identified diabetic "clinical markers". To be eligible to participate in the study, subjects must be current patients at the clinic, be at least 18 years old, and have been told by a health care practitioner that they have diabetes. Patients were called and asked to complete an IRB-approved questionnaire regarding demographics as well as beliefs about diabetes and diabetic management. Patients had the option of completing the questionnaire over the phone, or at a public meeting place.

### **Results:**

The results of the phone interview will be compared against their clinical charts as well as refill histories, clinic appointments, and HbA1c. The interview and chart outcomes will then be compared to find correlations regarding medication adherence.

### **Conclusion:**

Not yet determined

### **Learning Objectives:**

Name the barriers/facilitators to medication adherence.  
Understand strategies used to overcome these barriers

### **Self Assessment Questions:**

1. True/False: Pamphlets that are written in the Spanish Language are easily understood by the patient.
2. Name 3 things that you as a pharmacist can do to enhance medication adherence.

## **EVALUATION OF HYPERLIPIDEMIA AND LDL GOAL ATTAINMENT IN A CARDIOLOGY CLINIC**

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South Central Wisconsin Heart is an independent group of nine cardiologists located at Meriter Hospital and has identified a need for a lipid management program. The purpose of the study was two-fold: to evaluate current lipid management within the practice and to develop a lipid management program in accordance with the National Cholesterol Education Panel Adult Treatment Panel III (NCEP ATP III, May 2001).

One hundred fifty patients with diagnoses of hyperlipidemia, myocardial infarction, or diabetes mellitus were selected from the clinic database and retrospective chart reviews were completed. Data collected were: number of risk factors for coronary heart disease (CHD); medications; and lab values including lipid profile, AST, ALT, homocysteine, LP(a), and C-reactive protein (CRP). Results showed eighty-eight percent of patients had CHD or a risk equivalent (peripheral artery disease, abdominal aortic aneurysm, diabetes mellitus, symptomatic carotid artery disease or stroke). Only two-thirds of all patients had a lipid panel documented in their chart and one-half of the remaining patients were at their LDL goal. Fifteen percent of these patients were not on any lipid-lowering agent. Advanced lipid testing for nuclear magnetic resonance (NMR) and CRP was done in only four and three patients respectively. The results are similar to the Lipid Treatment Assessment Project (L-TAP, Arch Intern Med. 2000) where the authors found only twenty-eight percent of patients had achieved their LDL goal.

In conclusion, this group of cardiologists is not adhering to the NCEP ATP III guidelines regarding both primary and secondary prevention. The next step of this project is to educate cardiologists and nursing staff in the clinic about meeting the 2001 NCEP goals. Continued education and quality assurance programs will be necessary in achieving LDL goals.

### **Learning Objectives:**

Determine the adherence rate of cardiologists to the NCEP ATP III guidelines.

Know the CHD risk equivalents and goal LDL values for these patients.

### **Self Assessment Questions:**

Which of the following are considered CHD risk equivalents?

- a. Diabetes mellitus
- b. Peripheral artery disease
- c. Abdominal aortic aneurysm
- d. All of the above

The majority of patients at South Central Wisconsin Heart achieved their NCEP-ATP III LDL goal? T/F

**INCIDENCE OF CYTOMEGALOVIRUS AND NEUTROPENIA IN A COHORT OF PATIENTS ON VALGANCICLOVIR OR GANCICLOVIR PROPHYLAXIS IN POST-ORGAN TRANSPLANT PATIENTS**

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Valganciclovir is the most commonly used agent for the prevention of cytomegalovirus (CMV) in post-organ transplant patients. Due to an observed increase in neutropenia of patients on daily valganciclovir compared to standard ganciclovir dosing in previous studies, certain institutions commonly use reduced-dose valganciclovir for the prevention of CMV in post-organ transplant patients. The use of reduced-dose valganciclovir (every Monday, Wednesday, and Friday dosing or every other day dosing) for the prevention of cytomegalovirus (CMV) has not been studied, nor has it been compared to the previous standard of ganciclovir TID. Pharmacokinetic and bioavailability studies suggest that daily valganciclovir and thrice daily ganciclovir achieve similar serum concentrations, with no data to suggest the efficacy in this regimen. The incidence of neutropenia with reduced-dose valganciclovir has not been studied.

All patients from Northwestern Memorial Hospital who received an organ transplant and prophylactic valganciclovir (reduced-dose) or ganciclovir (full-dose) between January 1, 2000 and November 21, 2001 will be included in a retrospective cohort analysis following patients for 100 days post-organ transplant. To reach a power of 90%, 180 patients per group will be evaluated. Primary outcome variables will be CMV, defined by a positive serum CMV antigenemia, and development of neutropenia, defined by an absolute neutrophil count (ANC) < 1.0 K/μL. Confounding variables that will be included are demographics, CMV status, concomitant immunosuppression, episodes of rejection, development of fungal infection, blood transfusions, and type of transplant. A

Preliminary data will be presented.

**Learning Objectives:**

To identify therapeutic options for the prevention of CMV in post-organ transplant patients.  
To list the risk factors for the development of CMV infection in post-organ transplant patients.

**Self Assessment Questions:**

List two options for the prevention of CMV in post-organ transplant patients.  
Some risk factors for the development of CMV in post-transplant patients include: a) more episodes of rejection b) presence of fungal infections c) immunosuppressive medications d) donor positive CMV status e) all of the above.

**TRIAL OF DIRECT OBSERVATION TO DETECT MEDICATION ADMINISTRATION ERRORS.**

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A study using direct observation in the detection of medication errors began at St. Luke's Medical Center. Currently, incident reports used to document medication errors probably represent a small fraction of the total number of medication errors. Other studies have compared incident report review with direct observation and found that direct observation identifies more errors. A retrospective review of incident reports was conducted to assist in determining the error-reporting rate. Pharmacy interns were trained by the primary investigator to observe medication administration on nursing units. After completion of the observation phase, the primary investigator conducted chart audits to compare each dose observed with each prescriber's order. Any deviation between the charted orders and what was observed was recorded as an error according to medication error definitions used by the Center for Medicare and Medicaid Services. Based on interim analysis of seventy observed doses, the observed error rate is 8.6%. More observation data will be analyzed. The results will be used to identify opportunities for improvement of the medication use process. Lastly, the cost of direct observation will be determined to evaluate the practicality of using this process in the future to augment the current incident reporting system.

**Learning Objectives:**

List 2 limitations of incident reporting and 2 limitations of direct observation as medication administration error detection methods.

Describe the difference in medication administration error reporting rates between incident reports and direct observation.

**Self Assessment Questions:**

Observer bias is one limitation to using incident reports to identify medication administration errors. T / F  
The direct observation method identifies more medication administration errors than the incident reports method. T / F



## **EVALUATING PATIENT AWARENESS, ATTITUDES, AND SATISFACTION WITH POINT-OF-CARE A1C MONITORING AND EDUCATION IN A COMMUNITY PHARMACY**

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Monitoring hemoglobin A1C levels in people with diabetes is a valuable method of assessing their risk for developing diabetes-related complications. However, less than 20% of patients with diabetes participate in hemoglobin A1C monitoring. Studies such as the Asheville Project show that pharmacist intervention in people with diabetes decreases economic costs and improves health outcomes. The main objective of this study is to evaluate patient awareness and attitudes regarding diabetes and point-of-care A1C monitoring. A secondary objective is to evaluate patient satisfaction with a pharmacist-run monitoring and education service.

The setting for this study was a grocery-store community pharmacy. In-store marketing and physician referral was used to enroll 30 patients into the study. All patients had to be diagnosed with diabetes prior to participation. A baseline questionnaire evaluating patient awareness of A1C and attitudes toward diabetes was administered prior to monitoring. Patients then received individualized pharmacist-provided education on topics such as nutrition, self-monitoring blood glucose, and weight management. Monitoring and education sessions occurred in a private consultation office adjacent to the pharmacy. Collaboration with physicians was performed to ensure optimal patient care. A follow-up questionnaire evaluating the baseline criteria and patient satisfaction with the service was mailed to patients four weeks post-monitoring. Non-parametric statistical tests were used to compare changes in awareness and attitudes between the baseline and follow-up questionnaires.

The results of this study will be beneficial for community pharmacies conducting A1C monitoring and diabetes management programs. Patient satisfaction data will be used to evaluate the value of clinical services provided by pharmacists in the community setting. Pharmacist impact on patient awareness and attitudes regarding diabetes may lead to improved glycemic control and, ultimately, enhanced quality of life.

### **Learning Objectives:**

Identify ways to increase awareness of A1C monitoring in patients with diabetes.

Describe the level of patient satisfaction with point-of-care A1C monitoring in a community pharmacy setting.

### **Self Assessment Questions:**

Pharmacists in the community setting can increase patient awareness of diabetes with point-of-care A1C monitoring and education. T or F

Patients with diabetes are not very satisfied with pharmacist-run A1C monitoring and education programs in a community setting. T or F

## **V.A. DIABETES QUALITY IMPROVEMENT PROJECT**

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**Purpose:** Patients with diabetes and tight blood sugar control have significantly less end organ damage than poorly controlled patients. The purpose of this study is to evaluate the care of patients with diabetes enrolled in Diabetes Clinics at William S. Middleton Memorial Veterans Hospital. The goal is to assess accountability and quality improvement measures adapted from the Diabetes Quality Improvement Project (DQIP). This benchmark data will be presented to the diabetes team for review. It is anticipated that gaps in standards of care will be identified and addressed to improve the future quality of patient care.

**Methods:** Medical charts of patients with Type I and Type II diabetes seen at least once in any of the Madison VA Diabetes Clinics from July 1, 2001 to June 30, 2002 with intended follow-up will be retrospectively reviewed. The following information from the earliest visit in the date range noted above will be collected: medication profile, problem list, patient demographics, HbA1C, lipid profile, supine blood pressure, urine screen/microalbumin/timed urine collection, documentation of eye exam, documentation of foot exam, documentation of dental exam. Results analysis will be the percentage of subjects fulfilling each of the accountability and quality improvement measures.

**Summary/conclusion:** preliminary results will be presented.

### **Learning Objectives:**

Identify the VA DQIP indicators that are least often addressed at VA Diabetes Clinics.

State the clinical relevance of the VA DQIP indicators.

### **Self Assessment Questions:**

T/F: all VA DQIP indicator goals are met in >50% of the patients seen in Diabetes Clinic.

T/F: the VA DQIP HbA1C goal is <6%.

## **EXPERIENCES WITH OUTPATIENT INFUSIONS OF NESIRITIDE**

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**Purpose:** Nesiritide (Natreacor<sup>®</sup>, Scios) is a recombinant, human B-type natriuretic peptide that has been approved for use in acutely decompensated congestive heart failure (CHF). Nesiritide is being used in outpatient clinics in combination with optimized oral drug regimens to reduce hospital admissions and emergency department (ED) visits due to CHF as well as improve quality of life and functional status. The purpose of this study is to add to the limited body of data currently available regarding the use of nesiritide in outpatient clinics.

**Methods:** This study will be a retrospective chart review. NYHA class III-IV patients will be included if they have received at least 8 weeks of outpatient nesiritide therapy in the Healthy Hearts Center at Community Health Network.

**Preliminary Results:** Five patients were included for preliminary analysis. Most patients were treated once weekly with nesiritide bolus of 2mcg/kg followed by a 6-hour infusion of 0.01mcg/kg/min. Patients were treated for an average of 14 weeks and lost an average of 4.3 kg. Three patients improved NYHA class. Two patients reduced oral diuretic use. Three patients reduced the frequency of CHF related hospital admissions after starting nesiritide compared to the previous 6 months. Therapy was stopped in four patients due to clinical improvement and one patient continued therapy beyond the study period.

**Conclusions:** Intermittent infusions of nesiritide resulted in clinical improvement for four of the five patients analyzed here.

### **Learning Objectives:**

List the outcomes shown in the preliminary literature that suggest a benefit to using intermittent infusions of nesiritide in an outpatient setting.

Recognize drug interactions between inotropes and nesiritide, and recommend alternatives if the drugs are to be used concurrently.

### **Self Assessment Questions:**

T or F. Literature has been published that suggests an initial outpatient regimen of 0.005mcg/kg/min for 2 hours every month is appropriate.

T or F. Available premixed dobutamine products contain a preservative that interacts with nesiritide.

## **THE PREVALENCE OF POTENTIALLY INAPPROPRIATE MEDICATION USAGE IN AN ELDERLY VETERAN POPULATION**

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Inappropriate medication therapy is drug therapy with risks exceeding the possible health benefit. The elderly are most susceptible to medication induced adverse reactions. In 1991, the Beers criteria was written to determine inappropriate medication use in nursing home residents. They were expanded in 1997 to include the community-dwelling elderly. More recently, a panel for the Agency for Healthcare Research and Quality (AHRQ) agreed upon medications that are contraindicated or should generally be avoided in the elderly and medications that are contraindicated in the elderly by disease state. The purpose of this study was to evaluate the prevalence of potentially inappropriate medication usage in elderly veterans taking one or more of these potentially inappropriate medications before and after an intervention. Secondary objectives include patient demographics and the number of medications concurrently prescribed.

In this cross-sectional chart review, the prevalence of potentially inappropriate medication prescribing was evaluated at the Cleveland Veteran's Affairs Medical Center (VAMC). Included patients were 65 years or older, prescribed a potentially inappropriate medication by either age or disease state, and received medications through the Cleveland VAMC. Highly sedating or very anticholinergic medications were evaluated by patient age. Medications evaluated by disease states included: NSAIDs, b-blockers, disopyramide, sedative/hypnotics, metoclopramide, anticholinergic antihistamines or GI antispasmodics, and tricyclic antidepressants. Upon definition of a population, an intervention was made. Results are pending. A second evaluation will be completed after three months for assessment.

Potentially inappropriate medication usage is a documented problem in the elderly. Increasing prescriber awareness should prevent future medication misadventures, aid in the identification of existing disease state-drug interactions or medications that may be inappropriate based upon patient age, decrease medical costs and improve quality of life.

### **Learning Objectives:**

To present the prevalence and consequences of potentially inappropriate medication usage in the elderly.

To aid in the identification of existing disease state-drug interactions or medications that may be inappropriate based upon patient age.

### **Self Assessment Questions:**

T/F: The elderly should be closely monitored when initiating new medication therapy due to an increased risk of adverse drug reactions or potentiation of side effects.

T/F: A first-choice medication in the elderly would be one with significant renal excretion and a long half-life.

## IATROGENIC ANEMIA IN THE CRITICALLY ILL PATIENT

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**Purpose:** To evaluate the impact of transfusion rates after revision of phlebotomy policy and the initiation of an ICU anemia protocol utilizing recombinant human erythropoietin and vitamin supplementation.

**Methods:** Retrospective patients were identified by a 50% random sample from a hospital database (Project Impact) for all patients admitted to the neurology and medical intensive care units from October through December 2002 and the surgical intensive care unit from June through December 2002. Information was then retrieved by chart review. The inclusion criteria consisted of an ICU stay of 7 days or longer and a hematocrit value of 33% or less within the first 24 hours of ICU admission. Patients were excluded if they had active bleeding, uncontrolled hypertension, liver failure, refused blood products, or were pregnant. Prospective patients enrolled into the ICU anemia protocol were identified through a pharmacy database report. A Microsoft Access database was used to analyze all data. Outcomes will be compared between the groups and include transfusion rates in the ICU, hospital and ICU length of stay, amount of time on ventilation, myocardial infarction, need for dialysis, and status at discharge from the hospital. A cost benefit analysis will be compared between the groups.

**Preliminary Results:** The Project Impact database identified 29 possible retrospective patients according to ICU stay and hematocrit values of <33% within the first 24 hours of the ICU stay. After chart review, a total of 8 retrospective patients were excluded due to liver failure (n=2), active uncontrolled bleeding (n=5), or both (n=1). Twenty-one patients were included in the retrospective evaluation. To date, one prospective patient has been enrolled in the protocol.

### Learning Objectives:

To explain the etiology, prevention, and treatment of iatrogenic anemia in the critically ill patient.

List and explain the various benefits and risks associated with treatment modalities that may be used for prophylaxis and treatment of iatrogenic anemia in ICU patients.

### Self Assessment Questions:

Iatrogenic anemia in the critically ill patient can be attributed to:

- I. Blood loss due to phlebotomy, trauma, surgical loss, occult bleeding, and decreased red blood cell life span.
- II. Nutritional deficits in folate, iron, and vitamin B12.
- III. Enhanced erythropoietin response from increased inflammatory cytokines

- a. I only
- b. II only
- c. I & II only
- d. II & III only
- e. I, II, & III

Therapies for the prophylaxis of iatrogenic anemia ICU may include:

- I. Transfusions
- II. Nutritional supplementation including folate, iron, and vitamin B12
- III. Erythropoietin

- a. I only
- b. II only
- c. I & II only
- d. II & III only
- e. I, II, & III

## IMPLEMENTATION OF A NESIRITIDE INFUSION PROTOCOL

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**BACKGROUND:** Nesiritide, a human B-type natriuretic peptide, is a new drug approved for the treatment of acute decompensated congestive heart failure (CHF). The cost of nesiritide is significantly higher than other agents currently used for acute decompensated CHF. There is limited clinical data identifying the optimal dose, patient selection and economic implications.

**METHOD:** The pharmacy, in conjunction with nursing and physician input, introduced a protocol to assist in dosing of nesiritide and for monitoring efficacy and adverse effects. After a 2.5 month period of use, the pharmacy will perform chart review to compare the use of nesiritide before implementation of the protocol to the use after. The primary objectives of this review will be to monitor for relief of symptoms, dosage used, adverse effects, total charges per visit, length of stay, and 30 day readmission rate. The secondary objectives of review will seek to compare patients admitted with acute decompensated CHF who received nesiritide and those who were treated with standard therapy. In this comparison we will seek to determine whether treatment with nesiritide has affected our length of stay and our rate of readmission at both 3 days and 30 days.

**RESULTS:** Data collection and analysis are ongoing. Results will be presented at the conference.

### Learning Objectives:

To understand the mechanism of action, indication, dosage and adverse effects of nesiritide.

To assess the role of nesiritide in the management of acute decompensated CHF.

### Self Assessment Questions:

A higher percentage of patients received the recommended initial dosing of nesiritide after protocol implementation. T or F  
Patients who received nesiritide had a lower length of stay than those who didn't receive nesiritide. T or F

## **THE ADHERENCE TO A POST-OPERATIVE ATRIAL FIBRILLATION GUIDELINE IN CARDIOTHORACIC SURGERY PATIENTS**

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Atrial fibrillation (AF) is a common arrhythmia after cardiothoracic surgery that occurs in up to 50% of patients and may lengthen hospitalization. Treatment focuses on rate controlling agents or antiarrhythmic agents. Intravenous (IV) amiodarone may be useful for AF but studies comparing IV amiodarone with rate controlling agents have not shown superiority with either agent.

At our institution, IV amiodarone use has escalated to 53% in the cardiothoracic surgery population. With the increase in IV amiodarone use and potential for increased adverse effects, treatment guidelines were developed for post-operative AF in cardiothoracic surgery patients. If a patient develops AF, rate controlling agents are recommended. After 24 hours, if rate controlling therapy failed, amiodarone may be initiated at 150 mg intravenous piggy back followed by 400 mg orally twice daily.

A prospective study of cardiothoracic surgery patients is being performed from January through March 2003. The primary objective of this study is to examine the adherence to the post-operative AF guideline. Data collection includes patient demographics, the incidence of post-operative AF, time from surgery to AF, treatment given, time to conversion after treatment, risk factors for developing AF, adverse effects related to therapy, and length of stay.

From 1/1/03 until 2/28/03, one hundred and nine patients underwent cardiothoracic surgery. So far, eleven patients have developed AF after their procedure. Data collection is still in progress and will continue until 3/31/03.

Results of this study will determine the incidence of AF at our institution and guideline adherence. The results will be discussed with the Department of Thoracic Surgery and the Pharmacy and Therapeutics Committee to help determine if IV amiodarone is being used appropriately and if current guidelines need to be changed.

### **Learning Objectives:**

Discuss the incidence of post-operative atrial fibrillation in cardiothoracic surgery patients.

Discuss the treatment of post-operative atrial fibrillation in cardiothoracic surgery patients.

### **Self Assessment Questions:**

True or False. Atrial fibrillation may occur in 50% of patients after cardiothoracic surgery.

True or False. Antiarrhythmic agents are always first line agents used for post-operative atrial fibrillation.

## **ASTHMA TOOLBOX**

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Asthma Toolbox by Jamie Conley-Lebeter Indianapolis, IN  
The Asthma Toolbox is an educational tool filled with demonstration materials and a flip chart in English and Spanish to help the nursing staff educate patients with asthma. We will be giving inservices to the nursing staff at 13 clinics throughout the Indianapolis area with the goal of bringing structured asthma education to the visit site.

**Purpose:** To obtain an initial assessment of nursing comprehension before, immediately after, and three months following the asthma toolbox inservice. We will also assess utilization by keeping a use log in each box as well as assessing referral rates to the Asthma Coordinator.

**Methods:** We will be using a quiz before the inservice, immediately after the inservice, and 2 months following the inservice. We will also have a card placed in each box so that the nursing staff can check-off what they are using within the toolbox to educate.

**Summary of results:** We plan the inservices in January of 2003 followed by a two-month follow up.

**Conclusions:** Our goal is to bring standardized, easy to use educational materials to patients at the visit site.

### **Learning Objectives:**

To obtain an initial assessment of nursing comprehension of the disease state asthma before completing an inservice on the use of the asthma toolbox.

To obtain an assessment of the utilization of the asthma toolbox by nursing staff to better educate patients.

### **Self Assessment Questions:**

The learner should be able to explain how to use an asthma action plan to better educate patients with asthma.

The learner should be able to explain demonstrate an effective multidisciplinary approach to asthma education.

## **MANAGEMENT OF HYPERLIPIDEMIA IN HIV POSITIVE PATIENTS RECEIVING PROTEASE INHIBITORS.**

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### **BACKGROUND**

The use of protease inhibitors (PIs) in patients with HIV infection has shown to decrease mortality in this population. Some of the common metabolic complications seen with PIs are hyperlipidemia, hyperglycemia and lipodystrophy (fat redistribution). Currently, there are no guidelines available for the management of hyperlipidemia in HIV infected patients. The current NCEP-ATP III (National Cholesterol Education Program-Adult Treatment Panel III) guidelines are available for the management of hyperlipidemia in non-HIV patients.

### **PURPOSE**

The purpose of this study is to evaluate the management of hyperlipidemia in HIV positive patients at the West Side VA hospital based on the current NCEP-ATP III guidelines. In addition to evaluating the management of hyperlipidemia, this study will also assess hemoglobin A1c levels in patients with a diagnosis of diabetes, based on the recommendations of the ADA (American Diabetes Association). This additional information will be collected due to the effect of uncontrolled hyperglycemia on lipid levels and the need for more aggressive management of hyperlipidemia in patients with the diagnosis of diabetes.

### **METHODS**

This is a retrospective chart review of patients who received protease inhibitors from the West Side VA outpatient pharmacy from 4/1/01-3/30/02. They will be further divided into those on protease inhibitors as part of their therapy and not on antihyperlipidemic agents and those receiving both agents. In addition, those patients who also carry the diagnosis of diabetes will have their hemoglobin A1cs monitored. There are a total of 110 patients of which 13 carry the diagnosis of diabetes. All medical records will be reviewed for CHD risk factors, fasting lipid profile, liver function tests, hemoglobin A1c every 3-4 months.

### **RESULTS:**

Results to be reported at conference.

### **Learning Objectives:**

To identify the importance of managing hyperlipidemia and diabetes in HIV positive patients receiving protease inhibitors.

To assess the efficacy of hyperlipidemia and diabetes management in HIV positive patients receiving protease inhibitors.

### **Self Assessment Questions:**

The management of hyperlipidemia in HIV positive patients receiving protease inhibitors can be found in the current NCEP-ATP III guidelines. T F

Elevated LDL cholesterol is a major cause of CHD. T F

## **RETROSPECTIVE STUDY OF STEROID TAPER IN LIVER TRANSPLANTATION**

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Background: Patients that undergo liver transplantation require life long immunosuppression to maintain graft survival. The goal of an immunosuppression regimen is to maintain a balance between preserving the graft as well as sufficiently sustaining the immune system to protect against infections. Corticosteroids are used in combination with other immunosuppressants to maintain graft survival. Because of the unfavorable side effect profile associated with corticosteroids, the goal is to taper corticosteroids to the lowest therapeutic dose and to ultimately discontinue these drugs. Objective: The purpose of this study is to retrospectively review steroid tapers at 3 months and at 6 months in liver transplant recipients to determine the incidence of acute rejection, infection (hepatitis C and cytomegalovirus), diabetes, hypertension, weight gain, and hypercholesterolemia 1 year after steroid withdrawal.

Methods: A retrospective chart review will be conducted from August 1998 to March 2002 of patients that have received liver transplants at the University of Illinois Medical Center. The medical records of this population will be examined for the following outcomes: incidence of acute rejection, infection, diabetes, hypertension, weight gain, and hypercholesterolemia 1 year after steroid withdrawal. The outcomes will be compared for patients that received a 3 month steroid taper versus patients that received a 6 month steroid taper.

Results: Pending

Significance: This retrospective study will attempt to determine the incidence of acute rejection, recurrence of disease, and outcomes of the adverse events associated with a 3-month steroid taper vs. a 6-month steroid taper. The data may also help determine a more optimal time to discontinue corticosteroids in this patient population.

### **Learning Objectives:**

Discuss the incidence of adverse outcomes associated with corticosteroid use in liver transplant recipients.

Discuss the incidence of recurrence of hepatitis C infection with corticosteroid use at 3 months versus 6 months in liver transplant recipients.

### **Self Assessment Questions:**

True or False. The incidence of adverse outcomes of corticosteroid use is less at 3 months of use versus 6 months of use in liver transplant recipients.

True or False. Recurrence of hepatitis C is more likely at 3 months of corticosteroid use versus 6 months of use in liver transplant recipients.

## **EXTENDED STABILITY OF INTRAVENOUS PANTOPRAZOLE SODIUM**

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Pantoprazole sodium (Protonix®) for injection is a proton pump inhibitor used for the healing of erosive esophagitis associated with GERD, peptic ulcer disease, and active ulcer bleeding. Pantoprazole is the only proton pump inhibitor that is available in an intravenous formulation. Esomeprazole, lansoprazole, omeprazole, and rabeprazole are available in the oral dosage form.

Currently, the published stability guidelines from the manufacturer allow for a 12-hour expiration time of pantoprazole when prepared in 5% dextrose/water, 0.9% sodium chloride for injection or lactated ringer's injection. Pantoprazole has such a short stability from the manufacturer which has resulted in nearly 20% of the compounded product being destroyed when not used. Since data is not available for extended stability, this study will evaluate extended stability of pantoprazole at room temperature as well as under refrigeration and the possible cost savings that can result from this extended stability.

Test samples were prepared and evaluated during a trial (n=6) to determine the sample size needed. From this trial, the sample size was determined for a larger study for testing the amount of pantoprazole available at 0, 12, 24, 48, 72, and 96 hours. Prepared solution of pantoprazole 0.4mg/ml in 100ml of 5% dextrose/water will be tested using Gas Chromatograph Thermoionic Specific Detection and Gas Chromatograph Mass Spectrometry (GC/MS).

The results of this study will provide the stability information required to determine whether compounded doses of pantoprazole could be used beyond the 12-hour expiration time. If pantoprazole is found to have extended stability, this could translate into cost savings to the institution.

### **Learning Objectives:**

Discuss stability issues concerning intravenous pantoprazole.  
To assess the potential cost savings resulting from extended stability tests.

### **Self Assessment Questions:**

The manufacturer's current expiration time for a compounded dose of intravenous pantoprazole is 24 hours. T or F  
In what ways could an extended stability for intravenous pantoprazole result in a cost savings to an institution?

## **EVALUATION OF THE BINAX NOW STREPTOCOCCUS PNEUMONIAE URINE ANTIGEN ASSAY FOR COMMUNITY-ACQUIRED PNEUMONIA AND THE IMPACT ON ANTIMICROBIAL PRESCRIBING**

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Introduction: The Binax NOW immunochromatographic test for the detection of Streptococcus pneumoniae antigen in the urine is advocated to aid in the diagnosis of community-acquired pneumonia. The test was approved by the FDA because of its high sensitivity and specificity for pneumococcal bacteremia. However, its utility for patients with non-bacteremic pneumonia is not well defined. It's unclear whether test results will be sufficient to modify antimicrobial therapy in the absence of confirmatory tests.

Objective: Evaluate the sensitivity and specificity of the Binax NOW pneumococcal urine antigen test in hospitalized patients with suspected pneumonia; examine antimicrobial prescribing before and after the pneumococcal urine antigen results.

Methods: Records were reviewed for patients admitted between January and October 2002 who had the Binax NOW pneumococcal urine antigen test performed. Data collection included pneumococcal urine antigen test results; culture results; concomitant Legionella urine antigen test results, and changes in antimicrobial therapy. Patients were analyzed for "bacteremia" if blood cultures were obtained and were analyzed for "pneumonia" if blood or sputum cultures were obtained. Results: 148 pneumococcal urine antigen tests were performed for 145 patients from January to October 2002. 1 patient was diagnosed with pneumococcal meningitis and was excluded. 136 patients had a blood or sputum culture obtained and 105 patients had a blood culture obtained.

The sensitivity was 100% (2/2) for patients in the bacteremic group, specificity was 96% (98/102), positive predictive value was 33% (2/6) and the negative predictive value was 100% (98/98). For patients in the pneumonia group, sensitivity was 55% (5/9), specificity was 96% (121/126), positive predictive value was 50% (5/10), and the negative predictive value was 97% (121/125). In no case was antimicrobial therapy modified based on the urine antigen test result.

Conclusion: Based on cost and lack of clinical utility, we question the utility for pneumococcal urine antigen testing in hospitalized patients with community-acquired pneumonia.

### **Learning Objectives:**

Describe the mechanism and limitations of the Binax NOW pneumococcal urine antigen assay.  
Know the rate of bacteremia and coinfection with pneumococcal pneumonia.

### **Self Assessment Questions:**

List two characteristics of a microbiologic test that impact clinical practice.  
Describe the advantages and disadvantages of using the pneumococcal urine antigen assay for community-acquired pneumonia.

## **MINIMIZING THE RISK OF ADVERSE OUTCOMES ASSOCIATED WITH ENOXAPARIN**

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When enoxaparin was first introduced to the market and approved by the FDA it was the only low molecular weight heparin available. Since no routine coagulation monitoring for this agent was necessary, this offered the convenience of discharging a patient home from the hospital on enoxaparin. Therefore, enoxaparin became a more appealing agent when compared to conventional heparin. Enoxaparin now has seven FDA approved indications that have been proven effective with a minimal risk of major bleeds. Due to the clinical efficacy of this agent, evident by numerous successful clinical trials, the popularity of this agent has increased substantially.

The use of enoxaparin has climbed steadily at Froedtert Hospital with an annual expenditure over \$550,000. With no surprise, the number of adverse drug reactions (ADRs) has also escalated. This increase in ADRs could potentially be due to numerous reasons: an increase in administration of enoxaparin in the patients with multiple co-morbid disease states, a false sense of security that enoxaparin is associated with less incidence of bleeding, and that no routine coagulation monitoring is needed.

The purpose of this project is to minimize the risk of adverse outcomes associated with enoxaparin. A retrospective root cause analysis of the twenty-five severe ADRs associated with enoxaparin from 2001 and 2002 has been performed. This analysis will help identify specific trends associated with the adverse outcomes with enoxaparin therapy. In addition, a concurrent drug use evaluation (DUE) will be done to evaluate current prescribing patterns at our institution. Specific patient populations to be analyzed include body weight extremes, renal insufficiency, concomitant medications and the use of Anti-Xa levels. Based on the results of the retrospective root cause analysis and DUE, enoxaparin guidelines will be developed and implemented hospital wide.

### **Learning Objectives:**

To summarize the adverse drug reactions (ADRs) seen in a tertiary care teaching institution over the past two years.  
To understand what Anti-Xa levels are and when to use them as a monitoring tool.

### **Self Assessment Questions:**

Total clearance of enoxaparin is lower and elimination is delayed in patients with renal insufficiency (T or F)  
When should anti-Xa (LMWH) levels be drawn?

## **PATIENT SATISFACTION WITH IMMUNIZATION ADMINISTRATION IN CHAIN PHARMACY SETTINGS**

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Each year many community pharmacies offer influenza immunizations. Three ways in which pharmacies offer immunizations to patients include (1) mass immunizations provided by a contracted nursing service, (2) mass immunizations provided by a pharmacist, and (3) scheduled appointments with a pharmacist. The objectives of this study are to (1) compare patient satisfaction between three methods of offering immunizations currently being used by a grocery store chain and (2) assess whether receiving an immunization from a pharmacist changes patients' perception of pharmacists as service providers.

Patients and patrons of six Jewel-Osco stores in the Chicago metropolitan area were asked to participate. The stores were chosen based on number of immunizations given the prior year, type of immunization method used, and volume of prescriptions. A self-administered questionnaire was distributed to 235 patients after they received their influenza immunization. A group of non-immunized store shoppers are currently being surveyed to obtain data for a control group. The three immunization methods included (1) a nurse-run four hour walk-in clinic, (2) a pharmacist-run four hour walk-in clinic, and (3) a pharmacist-run by-appointment setting. Descriptive statistics have been used to evaluate patient satisfaction between the three immunization settings. Preliminary data suggest a significant increase in patient satisfaction when given an immunization in an appointment setting. Data is currently being collected to assess patients' perception of pharmacists as service providers.

The conclusions of this study will help determine which immunization method provides the highest patient satisfaction and whether having a pharmacist provide immunizations is a gateway for other disease management programs. These findings will help establish a model for future expansion and structure of our disease management and immunization programs.

### **Learning Objectives:**

To determine which immunization setting provides the highest satisfaction to patients.  
To assess whether immunizations influence patients' perceptions of pharmacists as service providers.

### **Self Assessment Questions:**

Patients are most satisfied when receiving an immunization at a nurse-run clinic? T or F  
Patients who received an immunization from a pharmacist are more accepting of pharmacists as service providers than patients who did not receive an immunization are? T or F

## **EVALUATION OF A PHARMACIST-CONDUCTED MEDICATION ADMISSION HISTORY PROGRAM IN A TEACHING INSTITUTION**

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The provision of clinical pharmacy services within hospitals has been shown to decrease medication errors, morbidity, and mortality; a pharmacist-conducted medication admission history program is one such service. In accordance with these findings, the goal of implementing a pharmacist-conducted medication admission history program is to prevent medication discrepancies on admission orders and improve patient safety.

This program is currently being piloted at Froedtert Hospital with a goal of at least 50 medication admission histories conducted by a pharmacist. Patient-specific inclusion criteria are: patients taking greater than two home medications, patients taking any narcotics prior to admission, and non-compliance with home medications as a suspected cause of admission. Patient-specific exclusion criteria are: anticipated length of stay less than 24 hours, admission to the intensive care or the labor and delivery units, and pediatric patients. Data analysis will be conducted both retrospectively and concurrently through chart review. The percentage of admission medication orders that have any discrepancy when taken from a medication admission history conducted by a nurse or a physician opposed to a pharmacist will be compared. Upon completion of the pilot, the process will be analyzed to assess the impact and time required to plan for hospital-wide implementation.

Tools that have been developed to ensure standardization when conducting a medication admission history include a form and a script for pharmacists to follow. Pharmacists will also be educated on skills required to complete a thorough medication admission history. Preliminary data will be presented at the Great Lakes Pharmacy Residency Conference.

### **Learning Objectives:**

To understand the value associated with a pharmacist-conducted medication admission history program.

To describe the tools necessary for obtaining a thorough medication admission history.

### **Self Assessment Questions:**

Pharmacist-conducted medication admission histories have been shown to decrease morbidity and mortality. T or F

List two tools that have been developed to ensure consistency when performing a medication admission history.

## **CHANGE IN PATIENT PERCEPTION OF PHARMACISTS AFTER EXPOSURE TO CLINICAL PHARMACY**

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For many years, patient perception of a pharmacist has been the classic picture of a man behind a counter filling a prescription written by a physician. Over the last few years, pharmacists have been taking large steps toward changing this view. Pharmacists are moving away from their traditional role as drug dispensers and are taking a more clinical role, adjusting medications, ordering labs, performing physical exams, etc. As the profession of pharmacy continues to change, it becomes important to gauge whether patient perception of the profession is also changing. The present study was undertaken to assess whether exposure to clinical pharmacy changes patient perception of pharmacists. The study is set in an internal medicine office in which pharmacists practice disease state management under consult agreement with physicians. Patient perception is tested by surveying patients at the initial visit with clinical pharmacist and again at three months. These results are then compared to results obtained from patients treated only by physicians. Patients are excluded from study if they have physical/psychological barriers that would prevent completion of survey, if they are unable to read English, or if they refuse to participate. Primary outcome is change in patient perception of a pharmacist, secondary outcomes include the effects of specific baseline characteristics such as, gender, income, level of education, prescription coverage and previous exposure to the profession of pharmacy on perception.

### **Learning Objectives:**

Assess impact of clinical pharmacy services on patient perception of pharmacists.

Identify patient characteristics that influence their perception of pharmacists.

### **Self Assessment Questions:**

Exposure to clinical pharmacy services improves patient perception of pharmacists. T F

Patients who have more prescriptions filled per month have an improved perception of pharmacists. T F



## **RETROSPECTIVE EVALUATION OF VANCOMYCIN DOSING AT AN OUTPATIENT HEMODIALYSIS (HD) CLINIC**

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Traditional dosing of vancomycin, a glycopeptide antibiotic active against Gram-positive bacteria, in HD patients is 1 gram IV administered immediately post-dialysis at a rate of 1000 mg/hr or less. Since HD patients require a 3-4 hour dialysis session thrice weekly, the post-dialysis vancomycin dosing approach is inconvenient to patients and puts additional strain on nursing and dialysis unit resources. In addition, the strategy of using standardized doses may potentially underdose obese patients who have a large volume of distribution or patients with residual renal function. Therefore, many clinicians now administer vancomycin during the last hour of the dialysis session. Redosing is planned according to pre-dialysis serum vancomycin levels to maintain levels of >10 mg/L. Presently, our outpatient HD clinic does not follow any specific vancomycin dosing and monitoring guideline. The purpose of this study is to assess current vancomycin dosing with regard to maintaining serum vancomycin predialysis levels greater than 10 mg/L during the course of therapy at the University of Michigan (UM) outpatient HD clinic. This is a retrospective chart review. Patients who received vancomycin empirically for an infection from January 1 to December 31, 2002 will be identified by the UM outpatient HD clinic database. The objectives of this study are to evaluate whether our current vancomycin dosing approach will consistently maintain vancomycin predialysis levels at or above the acceptable therapeutic level of 10 mg/L, to determine the frequency of redosing of vancomycin, to assess the frequency of adverse drug reactions from vancomycin and to identify the common pathogens for which vancomycin is prescribed based on culture results. The results of this study will determine if an action is needed to optimize vancomycin dosing at the UM outpatient HD clinic.

### **Learning Objectives:**

To identify the barriers that restrict the optimal use of vancomycin in a HD clinic.

To recognize the inconsistency in vancomycin dosing in a HD clinic.

### **Self Assessment Questions:**

Currently there is no consistent approach in vancomycin dosing among hemodialysis clinics? T or F

A standardized dose of vancomycin dosing approach may potentially underdose obese HD patients? T or F

## **THE IMPLEMENTATION OF A SMOKING CESSATION CLINIC**

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An estimated 46.5 million adults in the United States smoke cigarettes even though cigarette smoking is responsible for more than 400,000 deaths each year. The burden of tobacco use amounts to more than \$75 billion in medical expenditures and another \$80 billion in indirect costs. In the state of Indiana, smoking-attributable direct medical expenditures cost over \$1.6 million and smoking-attributable productivity cost over \$2.1 million.

It has been documented that the identification of smokers and subsequent counseling practices in physician's offices were significantly inferior to recommendations published in the national guidelines. Literature also supports positive outcomes of pharmacist managed smoking cessation clinics, which encompasses increased cessation rates and improved patient satisfaction.

The establishment of a pharmacist managed smoking cessation clinic (SCC) at the Indiana University/ Methodist Family Practice Center will promote smoking awareness and provide targeted therapy and counseling to patients identified as smokers. The SCC aims to provide written and oral patient education, patient counseling on smoking cessation, instruction and support in determining a course of action, provide counseling on proper use of smoking cessation tools/medications, and to prevent relapse and encourage sustained abstinence. At the SCC a total of three clinic visits will be made, initial consultation, two weeks, and one month. Subsequent phone calls will be made at two months, three months, six months, nine months, and at one year. To evaluate the outcome of the SCC, we hypothesized that the one-year abstinence rate will be no less than that of the estimated national rate of 7%. In addition, one unique outcome will be measured at one year: peak flow values. Compared to patient's baseline peak flow readings, values at one year of abstinence are expected to not decline.

### **Learning Objectives:**

Discuss the need for increased awareness and focus on smokers and smoking cessation in the community.

Discuss the services provided by the smoking cessation clinic.

### **Self Assessment Questions:**

According to the literature, adequate effort is placed on identifying and treating smokers in physicians' offices. T F

Over the past several years, we have reached the 2010 Healthy People Objectives for smoking cessation in adults.

T F

## **EFFECTIVENESS OF SURGICAL PROPHYLAXIS IN CARDIAC PATIENTS AND DETERMINATION OF SURGICAL SITE INFECTION RISK FACTORS**

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Surgical site infections (SSIs) are the most common nosocomial infections among surgical patients. The SSIs associated with the greatest morbidity are sternal wound infections (SWIs). Advances in infection control have been made but SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. Studies have shown that administering antibiotics 30 minutes or less prior to skin incision decreases the SSI rate. The current guidelines at Rush-Presbyterian St. Luke's Medical Center (RPSLMC) for clean cardiac surgery recommend cefazolin 1g at least 30 minutes prior to surgery and vancomycin 1g if penicillin/cephalosporin allergic. It is also suggested that for procedures lasting greater than 4 hours, cefazolin should be repeated and for procedures lasting greater than 12 hours, vancomycin should be repeated. Identifying risk factors for SSIs in post-operative cardiac patients is important in order to reduce morbidity and mortality. It allows the practitioner opportunity for appropriate antibiotic choice. The purposes of this investigation are: (1) to evaluate the compliance of the current guidelines for antimicrobial prophylaxis in cardiac surgeries conducted at RPSLMC; (2) to identify patients who develop SWIs despite appropriate use of antibiotics. And (3), to determine why patients treated appropriately still developed infections and to identify risk factors for SSI. **METHODS:** Retrospective chart review of cardiac surgeries performed at RPSLMC from January 1, 2000 to December 31, 2001. Patients who developed SWIs despite appropriate antibiotic prophylaxis will be identified to evaluate potential risk factors for SSIs. These patients will be compared to a matched cohort group to compare SWI rates pre- and post-implementation of the surgical antibiotic prophylaxis guidelines. **RESULTS:** To be presented at the conference. **CONCLUSION:** To be presented at the conference.

### **Learning Objectives:**

Recognize the 3 most common risk factors associated with SSIs.

Discuss appropriate antibiotic regimens for clean cardiac surgeries

### **Self Assessment Questions:**

All of the following are risk factors associated with SSIs EXCEPT: A) Elevated postoperative blood glucose levels; B) Obesity; C) Age; D) History of asthma.

The most appropriate time for administering antibiotic prophylaxis prior to surgery is: A) 15 min; B) 30 min; C) 45 min; D) 1 hour.

## **HYPERLIPIDEMIA MANAGEMENT IN PATIENTS WITH HIV IN A VETERANS AFFAIRS MEDICAL CENTER**

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As a direct consequence of highly active antiretroviral therapy (HAART), HIV patients are experiencing delays in disease progression and living longer. These agents have significantly advanced the treatment and management of HIV; however, recent attention has focused on the long-term safety and potential metabolic complications of these medications. One complication of concern is hyperlipidemia, which increases the risk of coronary artery disease. The objective of this study was to determine whether or not patients with HIV are being adequately managed according to the National Cholesterol Education Program (NCEP ATP-III) guidelines in an ambulatory HIV clinic.

A computer-generated list of all active HIV clinic patients from October 1, 2000 to September 30, 2002 was obtained, and all 140 patients were reviewed. Data collected included: patient demographics, antiretroviral therapy history, coronary artery disease (CAD) risk factors, and laboratory values, including lipid profiles, liver function tests, viral loads, and CD4 counts.

A retrospective analysis was performed to determine those patients not currently at their NCEP goal for hyperlipidemia treatment. Twenty-eight patients (20%) did not meet their LDL goal. Of these patients, 40% were on a protease inhibitor while 49% were on efavirenz. Only nine patients (32%) were receiving drug therapy for their elevated LDL. For hypertriglyceridemia, ninety-one patients (65%) had a triglyceride level > 150mg/dL (average level was 429 mg/dL), and most of these patients (53%) were on efavirenz. Follow-up monitoring with lipid profiles and liver function tests were infrequently assessed. The average time to the last fasting lipid profile was 10.5 + 3.9 months.

Results from this study will be utilized in the development of a hyperlipidemia treatment protocol for HIV patients within the institution. A nurse practitioner and clinical pharmacist will then ensure the protocol is followed in an effort to improve hyperlipidemia management within this patient population.

### **Learning Objectives:**

List five major risk factors that modify LDL goals.

Recommend appropriate therapy and initial starting dose for a patient on a protease inhibitor with hyperlipidemia.

### **Self Assessment Questions:**

For any patient receiving a protease inhibitor and needing lipid-lowering therapy, it is recommended that atorvastatin or pravastatin be used instead of simvastatin. T or F

Due to the increased risk of myopathies with combination use of fibric acid derivatives and antiretrovirals, niacin is considered the drug of choice for patients with isolated hypertriglyceridemia. T or F

## **MEDICATION USE EVALUATION OF NESIRITIDE (NATRECOR)**

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Standard therapy for acute symptoms of congestive heart failure (CHF) includes the use of intravenous loop-diuretics, dobutamine, milrinone and nitroglycerin in addition to chronic medications such as an ACE-inhibitor, diuretic, beta blocker, and digoxin. Congestive heart failure can be caused by a combination of factors such as neurohormonal and hemodynamic imbalance, sympathetic activation, and myocardial damage. Nesiritide, a beta-type natriuretic peptide, is a new intravenous drug that improves hemodynamic and symptomatic effects through vasodilation, neurohormonal suppression, and enhanced natriuresis and diuresis.

The purpose of this project is to assess the appropriateness and cost-effectiveness of nesiritide therapy in CHF patients. Secondary objectives are to educate physicians, nurses, and pharmacists on the proper use and monitoring of nesiritide in CHF patients as well as to assess the safety of nesiritide.

Methods for this project include: development of prospective nesiritide medication use evaluation (MUE), identification of CHF patients who have been prescribed nesiritide, perform chart reviews to determine signs and symptoms of CHF, dose and length of therapy, effectiveness of therapy, adverse effects, and concomitant drugs, analysis of MUE data, and education of pharmacists, physicians, and nurses on appropriate use, administration, and monitoring of nesiritide in CHF patients.

Data collection for this project is ongoing. Currently, the MUE has been developed and data collected for approximately 60 patients. Preliminary results show nesiritide is being prescribed before maximum doses are reached of standard CHF medications, a nesiritide bolus dose if often not administered prior to maintenance dose, nesiritide therapy often results in relief of CHF symptoms, and the most common adverse drug reaction causing discontinuation of therapy is hypotension.

### **Learning Objectives:**

Discuss role of nesiritide therapy in congestive heart failure  
Review proper administration and monitoring of CHF patients on nesiritide therapy.

### **Self Assessment Questions:**

The recommended dose of nesiritide is a 2 mcg/kg bolus, followed by a 0.01 mcg/kg/min maintenance dose. T or F  
List two key monitoring parameters for a CHF patient on nesiritide therapy.

## **WARFARIN DOSE REQUIREMENTS IN CANCER AND NON-CANCER PATIENTS**

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Background: Cancer patients may require different warfarin doses compared to non-cancer patients who need anticoagulation. However, the current standard of care recommends the same titration scheme for nearly every warfarin-naïve patient. Factors, including elevated cytokine production, weight fluctuation, treatment, and adverse events, may cause cancer patients to spend a greater percentage of time outside their target international normalized ratio (INR) range as compared with non-cancer patients.

Objectives: To determine if patients with cancer have different warfarin dose requirements, we propose to compare weekly warfarin dose requirements between cancer and non-cancer patients, compare the percentage of time the INR is within the target range between cancer and non-cancer patients, compare the incidence and severity of bleeding in patients with and without cancer, and compare the incidence of thromboembolic complications in patients with and without cancer.

Methods: This is a retrospective chart review looking at patients receiving warfarin at the University of Illinois Medical Center (UICMC) Antithrombosis Clinic and Oncology Outpatient Pharmacy in whom warfarin anticoagulation was initiated between June 1, 1999 and June 1, 2003. Using a data collection form, we will record age, gender, race/ethnicity, weight, reason for anticoagulation, goal INR, warfarin start and stop date, average weekly dose, percentage of time within target INR, concomitant disease states, concurrent medication(s), incidence of major and minor bleeding, and incidence of thromboembolic events. We will also record the type of cancer, date of diagnosis, stage of cancer, treatment, status of disease, and complications during specific treatment cycles that may affect the INR and incidence of bleeding or thromboembolism.

Results/Conclusions: Forthcoming

### **Learning Objectives:**

Assess if anticoagulation in cancer patients is different than in non-cancer patients.  
Evaluate if it is necessary to develop a warfarin dose titration algorithm specific to cancer patients.

### **Self Assessment Questions:**

Cancer patients are predisposed to thrombosis.  
Warfarin is the only oral anticoagulant available in the U.S.

## **ASSESSING THE EFFECTIVENESS OF TRAINING METHODS FOR PHARMACY TECHNICIANS**

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Data from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) implicated orientation/training as the root cause of almost 60% of medication errors reported between 1995 - 2002. St. Luke's Medical Center is a 711-bed hospital that employs almost 100 pharmacy technicians. Their roles and responsibilities have evolved from merely delivering medications to a combination of both distributive tasks and technician order entry. Because of changes in the technicians' role, training has become a focus within the pharmacy department. Currently there are 35 different job functions divided between first, second, and third shift. Technicians receive approximately five days of on-the-job training for at least 4-5 different functions. Recently, a training manual was developed to ensure that the majority of necessary information would be consistently conveyed during training. The purpose of this project is to develop a standard tool that will be used to evaluate the effectiveness of the current training method. The evaluation tool is divided into two segments - a written and an observational section. Upon training completion, the technician will complete the written evaluation to assess if fundamental knowledge and skills were acquired. Next, a technician trainer or lead technician will imperceptibly observe their job performance for one day to assess if learned knowledge and skills are demonstrated. The score for job performance will be based on how well the technician performs on both the written and observational evaluation. If job performance scores are low, we will determine if the cause(s) are training (knowledge and skills) or non-training (rewards, feedback, or working environment) related. Currently, the evaluation tool focuses on one particular job function; however, the ultimate goal is to expand this evaluation tool to all 35 available job functions.

### **Learning Objectives:**

Describe current training methods at St. Luke's Medical Center  
Describe one method of assessing the effectiveness of training methods

### **Self Assessment Questions:**

Orientation/training was implicated as the root cause of approximately 60% of medication errors. T or F  
Poor job performance could be related to both training and non-training related problems. T or F

## **A RETROSPECTIVE ANALYSIS OF THE RISK FACTORS ASSOCIATED WITH C. DIFFICILE-ASSOCIATED DIARRHEA AT A VA HOSPITAL**

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**Purpose:** The purpose of this study was to evaluate the patient characteristics and risk factors associated with C. difficile-associated diarrhea (CDAD) in our VA population, focusing specifically on the newer antibiotics as potential causes.

**Methods:** 150 hospitalized patients with CDAD between January 1, 2000 to December 31, 2001 were retrospectively identified from assay toxin results. This group was compared to a cohort of 300 hospitalized patients, matched by age, without a diagnosis of CDAD during the same time period. Data collection included demographics, hospital unit of stay, co-morbid conditions, antibiotics received, and mortality.

**Results:** Gender and age were similar in both groups. Co-morbid conditions that were associated more often with the case group than the control group included cancer (33% vs. 22.3%) and COPD (30% vs. 19.3%). The total number of patients receiving antibiotics in the case group was 122/150 (81.3%) versus 152/300 (50.7%) of control patients. In the case and cohort groups respectively, the percentage of patients receiving the most common antibiotics included: levofloxacin (58% and 21.3%), IV vancomycin (33% and 7.3%), clindamycin (32% and 2.6%), piperacillin/tazobactam (24% and 3.6%), ampicillin/sulbactam (19.3% and 8.3%), ceftriaxone (19.3% and 5%), cefazolin (18% and 13.7%), ceftazidime (10.7% and 1%), azithromycin (14% and 7.3%), imipenem/cilastatin (11.3% and 0.67%), and cefepime (10% and 1.3%). A higher mortality rate was seen in case versus control patients (55% vs. 23%).

**Conclusions:** Levofloxacin, IV vancomycin, and clindamycin were the most commonly prescribed antibiotics before development of CDAD. CDAD may be associated with increased mortality.

### **Learning Objectives:**

List the top three antibiotics that patients received prior to developing CDAD.  
Summarize the data and determine if CDAD may be associated with an increase in mortality at our institution.

### **Self Assessment Questions:**

Levofloxacin, IV vancomycin, and clindamycin are the antibiotics most frequently associated with CDAD. T or F  
There were no differences in mortality rates between the case and the cohort patients. T or F

## **COMPLIANCE PATTERNS IN METABOLIC SYNDROME PATIENTS WITH AND WITHOUT A CARDIAC EVENT.**

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Metabolic syndrome is a term for a collection of major risk factors for coronary artery disease (CAD). They include abdominal obesity, hypertension, type 2 diabetes and dyslipidemia. Treatment for metabolic syndrome often involves complicated multi-drug regimens. Ironically(?), patients often experience a low frequency of symptoms. Considered together, these factors contribute to poor medication adherence.

This study will assess compliance among patients with metabolic syndrome that experienced a vascular event versus patients with metabolic syndrome who did not. Patients over 50 years of age with metabolic syndrome will be identified. They will be divided into primary and secondary prevention groups based on presence or absence of a major cardiovascular or cerebrovascular event. Prescription claims data will be obtained, and a compliance rate or medication possession ratio for 12 months after each patient's index date (date of vascular event or initiation of therapy) will be calculated based on the total number of days supplied and the number of days between the first and last refills.

The primary endpoint will be whether there is a statistical difference in compliance rates between the two groups after one year. A Student's t-test will be used with a confidence interval of 95%. Secondary endpoints will be monthly data to see when a statistical difference becomes apparent. Sample size was calculated based on the time when 50% of patients are expected to become non-compliant with their medications. In order to determine compliance with a 95% confidence interval, 139 patients will be needed in each group.

### **Learning Objectives:**

Discuss metabolic syndrome and the incidence and prevalence in the United States.

Discuss medication compliance rates among patients with metabolic syndrome.

### **Self Assessment Questions:**

Metabolic syndrome is not a significant health care issue in the United States today. (T or F)

Patients with metabolic syndrome who have experienced a cardiac event are more likely to be compliant with medication regimens than those who have not had a cardiac event. (T or F)

## **LOW MOLECULAR WEIGHT HEPARINS BRIDGE THERAPY IN PATIENTS RECEIVING WARFARIN: A RETROSPECTIVE EVALUATION**

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With the use of subcutaneously administered low molecular weight heparins (LMWH), patients can be managed on an outpatient basis for certain indications. LMWH have gained popularity and they are being used instead of unfractionated heparin to manage high-risk patients who require anticoagulation coverage during subtherapeutic INR periods. This specific usage of LMWH in patients receiving warfarin is known as LMWH bridge therapy. This study will evaluate the safety and efficacy of LMWH bridge therapy by investigating the types of conditions requiring LMWH bridge therapy, the LMWH used, thromboembolic events, bleeding complications and number of hospital days saved.

This study is a retrospective chart review of patients who received LMWH bridge therapy. Patients were selected from the UIC Antithrombosis Clinic medical records from August 1997 to February 2003. Patient demographics, reasons for use of warfarin, types of LMWH, types of surgical or dental procedures, doses of LMWH, number of days of LMWH therapy, bleeding complications, blood clot formation events and other adverse effects will be collected and results. This retrospective study will help to gain more insight on LMWH bridge therapy and results will be presented.

### **Learning Objectives:**

To introduce the concept of LMWH bridge therapy

To discuss the safety and efficacy of utilizing LMWH bridge therapy

### **Self Assessment Questions:**

LMWH bridge therapy is generally safe and effective. T or F  
LMWH bridge therapy can decrease the number of hospital days needed. T or F

## **EVALUATION OF DARBEPOETIN ALFA USE IN A HOSPITAL BASED OUTPATIENT ONCOLOGY CLINIC**

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Erythropoietic agents have been proven in clinical trials to safely and effectively treat anemia in patients with cancer. When used properly, these agents can decrease blood transfusion rates, increase quality of life, improve prognosis and reduce mortality rates. Because of the benefits, these erythropoietic agents are being utilized more frequently, making them the top drug expense for our institution. Historically, once-a-week erythropoietin alfa has been used in this patient population. However, a longer-acting agent, darbepoetin alfa, dosed every other week, has recently entered into this market. Because of the potential cost savings, the seemingly effective response and patient convenience, the use of darbepoetin alfa was started at our clinic. Overall, this newer agent has provided us with an opportunity to re-evaluate the existing treatment guidelines for erythropoietin alfa, and develop new guidelines for darbepoetin alfa.

This is a review of patients given darbepoetin alfa or erythropoietin alfa for the months of February and March 2003. Data collected and analyzed during this time period will be compared to that from September and October 2002. The effectiveness of darbepoetin alfa, based on hemoglobin response, will be compared to that of similarly profiled patients on erythropoietin alfa. We will also look at the cost differential, based on an annualized comparison of the selected months. Finally, we will assess the effectiveness and compliance of the guidelines and clinical interventions made after staff re-education.

The results of this project will help us determine if darbepoetin alfa produces similar effects compared to those seen with erythropoietin alfa in cancer-related anemic patients. This information, along with published studies, will form the basis of Kellogg Cancer Care Center's guidelines for the use of erythropoietic agents.

### **Learning Objectives:**

To learn how a specific institution evaluates a newly introduced agent.

To understand the dose modifying guidelines developed for optimizing the use of erythropoietic agents.

### **Self Assessment Questions:**

What treatment options are currently available to treat anemia in an oncology setting?

Monitoring hemoglobin levels and dose adjusting the erythropoiesis stimulating agents should only be done in severely anemic patients. T or F

## **DEVELOPMENT AND IMPLEMENTATION OF A PROTOCOL FOR THE USE OF EPOETIN ALFA IN ANEMIA IN THE ADULT CRITICAL CARE SETTING**

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Anemia is a common complication of patients admitted to intensive care units. Blood transfusions, a standard therapy for anemia, are associated with infection, immunomodulation, hemolytic reactions, and other risks. Therefore, recombinant human erythropoietin has recently been investigated for the treatment of anemia in critically ill patients. The surgical intensive care unit (SICU) currently uses epoetin alfa to treat anemia in critically ill patients. However, there are no criteria as to which patients should be started on epoetin alfa, doses of the medication and monitoring parameters are not consistent, and patients are not always started on iron therapy while receiving epoetin alfa. The purpose of this study is to develop guidelines for the use of epoetin alfa in SICU patients and to observe the effect of epoetin alfa on reducing blood transfusions.

Prospective and retrospective cohorts are used in this study to compare epoetin alfa use before and after protocol implementation. The retrospective sample includes 97 patients who were admitted to the SICU prior to protocol implementation but would have met protocol inclusion criteria. The prospective study sample includes 70 patients admitted to the SICU who meet inclusion criteria of 18 years or older, anticipated ICU stay of greater than 7 days, and a hematocrit value less than 38%. Patients enrolled in the study receive epoetin alfa 40,000 units by subcutaneous injection weekly. Data collection includes hemoglobin and hematocrit values, reticulocyte count, and number of blood transfusions. Data comparison between the prospective and retrospective cohorts is in progress.

The study is currently ongoing. Results will be reported at the program.

### **Learning Objectives:**

Determine what criteria should be included in an epoetin alfa protocol.

Based on study results and current literature, evaluate the effectiveness of epoetin alfa in reducing blood transfusions in critically ill patients.

### **Self Assessment Questions:**

Exclusions to epoetin alfa therapy include uncontrolled hypertension and pregnancy. T or F

In this study, epoetin alfa reduced the number of blood transfusions between the retrospective and prospective cohorts. T or F

## **EFFECTIVENESS OF RECOMBINANT HUMAN ERYTHROPOIETIN IN EXTREMELY LOW BIRTH WEIGHT INFANTS**

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Extremely low birth weight infants (ELBW < or =1000 grams) are rapidly growing and most will double their weight prior to discharge. In order for premature infants to grow and thrive, they need adequate blood supply to transport oxygen. These infants are at risk for developing anemia of prematurity (AOP). AOP is thought to be due to a combination of factors including rapid growth rate, phlebotomy losses, shortened fetal red blood cell half life, and low intrinsic erythropoietin (EPO) levels. A delay in transfer of EPO production from the liver, the primary site of production in the fetus, to the kidneys may also be a contributing factor. Treatment options for AOP include strict transfusion guidelines, reduction in phlebotomy losses, and in some cases recombinant human erythropoietin (rHeEPO), but these treatments are not without risks or cost.

The objective of this study is to determine the effectiveness of rHeEPO by comparing a treatment group receiving rHeEPO when it was standard therapy and a control group not receiving rHeEPO. Transfusion guidelines remained the same during the entire study period. Data collection will be done via a retrospective chart review. The treatment group will be ELBW infants admitted to the NICU from January 1, 2001 to August 31, 2001. The control group will be ELBW infants admitted to the NICU from January 1, 2002 to August 31, 2002.

The effectiveness of rHeEPO will be measured by the total number and volume of transfusions, as well as the number of donor exposures per infant. Secondary points of interest include length of stay and cost difference. Data collection and analysis are ongoing.

### **Learning Objectives:**

Understand the pathophysiology of anemia of prematurity.  
Compare a group of ELBW infants receiving rHeEPO and a group of ELBW infants not receiving rHeEPO.

### **Self Assessment Questions:**

Anemia of prematurity can occur as early as Day of Life 1. T or F  
The cause of anemia of prematurity is multifactorial. T or F

## **VITAMIN D AND SKELETAL HEALTH IN OLDER VETERANS RECEIVING CARBAMAZEPINE OR PHENYTOIN**

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### **BACKGROUND:**

Effects of long-term enzyme-inducing antiepileptic drug therapy on vitamin D status of older persons has not been well studied. Use of enzyme-inducing antiepileptic drugs is associated with altered vitamin D metabolism leading to vitamin D inadequacy. Vitamin D insufficiency weakens bones, impairs muscle strength, and predisposes to fracture. We anticipate that this study will determine the need for, and efficacy of, oral vitamin D supplementation (one 50,000 IU capsule once weekly or one 50,000 IU capsule once monthly) in older veterans receiving monotherapy with either of the enzyme-inducing antiepileptic drugs carbamazepine or phenytoin. We hypothesize that monthly vitamin D supplementation will restore and maintain serum 25-OH vitamin D, decrease elevated serum PTH, and normalization of 25-OH vitamin D may improve bone density.

### **METHODS:**

Thirty-five ambulatory veterans > 50 years old enrolled in the Madison, WI VA Neurology Clinic and receiving specific inducing antiepileptic medication (phenytoin or carbamazepine monotherapy) for at least one year were included in the study starting from December 2002 to April 2004. All veterans will undergo a bone density measurement (DXA) and specific laboratory tests including: intact PTH, 25-OH vitamin D, serum alkaline phosphatase, total serum calcium, serum creatinine, and serum albumin, prior to enrollment. Veterans with a 25-OH vitamin D level between 15-30ng/ml will be given Vitamin D 50,000 units once monthly. Those with a baseline level <15ng/ml will be given Vitamin D 50,000 units once weekly for six weeks, followed by one capsule monthly. Veterans with 25-OH vitamin D >30ng/ml at baseline will be discontinued from the study. A referral to osteoporosis clinic will be made if veterans have a T-score <-2.0 or is <-1.5 with positive risk factors.

### **PRELIMINARY RESULTS:**

Currently in enrollment phase.

### **Learning Objectives:**

Describe vitamin D and parathyroid physiology on bone mineralization, formation, and resorption.  
Understand the effects of long term enzyme-inducing antiepileptic medications on 25-OH vitamin D status.

### **Self Assessment Questions:**

Vitamin D facilitates bone mineralization by promoting serum calcium excretion. (T/F)

Decreased 25-OH vitamin D may result from long term enzyme-inducing drug effects on:

- a) induction of hepatic cytochrome P450 enzymes
- b) impairment of the 25 hydroxylation of vitamin D
- c) inhibition of hepatic cytochrome P450 enzymes
- d) a and c
- e) a and b

## **INTRAVENOUS PANTOPRAZOLE USE IN A HOSPITAL: IS IT APPROPRIATE?**

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Since the introduction of intravenous (IV) pantoprazole, there has been an increase in the use of this agent in our institution. More cost-effective formulary agents are available, including intravenous famotidine, and lansoprazole capsules and suspension.

**PURPOSE:** The purpose of this study is to determine the appropriateness of IV pantoprazole prescribing in a hospital setting and develop therapeutic guidelines for the use of this agent.

**METHODS:** A retrospective chart review of patients prescribed IV pantoprazole admitted to the University of Illinois Medical Center at Chicago from March 2001 until December 2002 was performed. Appropriate indications for the use of IV pantoprazole include short term alternative treatment of GERD with history of erosive esophagitis and hypersecretion associated with Zollinger-Ellison Syndrome in patients unable to take an oral proton pump inhibitor. The literature supports the use of IV pantoprazole to prevent rebleeding in patients with upper gastrointestinal bleeds who underwent endoscopic therapy and are high risk for rebleeding. High risk was defined as a spurting arterial bleed, non-bleeding visible vessel or overlying clot on the vessel.

**PRELIMINARY RESULTS:** Fifty six patients were evaluated and 50 patients were included in the analysis. Fifty six percent of patients were prescribed IV pantoprazole for an upper GI bleed, 24% for stress ulcer prophylaxis, and 6% for a NPO diet order. Only 29 patients (58%) had endoscopy performed and 3 patients received endoscopic therapy. Ninety four percent of patients did not have an appropriate indication for IV pantoprazole. Three patients were found to have an appropriate indication for IV pantoprazole but the dosing regimen was not appropriate.

**CONCLUSIONS:** Intravenous pantoprazole has been used for a number of inappropriate indications and at inappropriate doses. The development of therapeutic guidelines and education of the medical staff may lead to appropriate use of this expensive agent.

### **Learning Objectives:**

Assess which patients would benefit most from IV pantoprazole treatment.

Develop therapeutic guidelines for the appropriate use and dosing of intravenous pantoprazole.

### **Self Assessment Questions:**

According to the literature, in what patients is IV pantoprazole indicated?

What are ways we can assure appropriate use of this agent in the inpatient setting?

## **EVALUATION OF BETA BLOCKER USAGE AND DOSAGE OPTIMIZATION IN HEART FAILURE PATIENTS AT A VA HOSPITAL**

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In 2001, the American College of Cardiology (ACC) and American Heart Association (AHA) collaborated to update their heart failure management guidelines. In this update, beta blockade is highly recommended in asymptomatic patients with structural damage. Furthermore, in patients with symptomatic heart failure, beta blockers have been shown to reduce morbidity and mortality. This is significant since heart failure continues to increase in incidence and prevalence and is the number one reason for hospital admissions in the Medicare population.

### **PURPOSE:**

To determine whether heart failure patients in the VA Chicago Health Care System have active prescriptions for beta blockers and if doses are being optimized according to the ACC/AHA guidelines.

### **METHODS:**

Four hundred thirty five patients with a documented inpatient or outpatient diagnosis of heart failure from September 1, 2001 to September 30, 2002 were randomly selected for this retrospective analysis. Only patients with left ventricular systolic dysfunction and ejection fraction less than or equal to 40% were eligible. For approximately two hundred patients meeting this entry criteria, the following information was recorded from patients' electronic charts: 1) demographic data, 2) beta blocker prescribed; initial and current dosage regimen, 3) ACE inhibitor usage/current dose, 4) other heart failure medications, 5) heart failure hospitalizations, 6) other hospitalizations, and 7) death.

**RESULTS/CONCLUSIONS:** Data analysis in progress.

### **Learning Objectives:**

Discuss the absolute contraindications to beta blocker therapy.

Identify which beta blockers have been proven to decrease mortality in heart failure.

### **Self Assessment Questions:**

Reactive airway disease is an absolute contraindication to beta blocker therapy. True or False.

What is the goal dose of immediate release metoprolol in heart failure patients?



**COMPLIANCE WITH THE AMERICAN COLLEGE OF RHEUMATOLOGY GUIDELINES FOR THE PREVENTION OF GLUCOCORTICOID-INDUCED OSTEOPOROSIS IN A VETERANS POPULATION**

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**Background:** Long-term glucocorticoid therapy is a common cause of drug-related osteoporosis. The American College of Rheumatology (ACR) has published guidelines for prevention of glucocorticoid-induced osteoporosis.

**Objectives:** The objectives are to determine adherence to ACR guidelines for the prevention of glucocorticoid-induced osteoporosis in a veteran male population and to identify the characteristics associated with the use of prophylactic pharmacotherapy.

**Methods:** A cross sectional review of pharmacy records was conducted to identify male veterans = 18 years of age with an active prescription for =5 mg of prednisone equivalent per day for = 90 days from the Louis Stokes Cleveland Veteran Affairs Medical Center (LS-VAMC). Patients were excluded if they were receiving steroids for the treatment of adrenal insufficiency or were unlikely candidates for prevention due to metabolic bone disease, abnormal serum chemistries, or a history of nephrolithiasis. Data collection included patient age, glucocorticoid history, prophylactic therapy, and evaluation of hypogonadism and bone mineral density (BMD). Based on the national average of adherence to ACR guidelines, it was predicted that 40% of veterans receiving long-term glucocorticoid therapy would be in compliance ACR guidelines.

**Preliminary Results:** Of the 610 male veterans who met inclusion criteria, approximately 30% had an active prescription for preventative therapy. Only 3 patients had a BMD performed within the last year. In an effort to improve prevention of steroid-induced osteoporosis the Pharmacy Department at LS-VAMC created computerized order sets for the prescribing of long-term glucocorticoids, BMD scans, and prophylactic therapy for glucocorticoid-induced osteoporosis. Adherence rates will be re-evaluated 3 months post-intervention.

**Conclusion:** The adherence to the ACR guidelines for the prevention of glucocorticoid-induced osteoporosis at the LS-VAMC was less than the national average. A computerized intervention has been designed to promote compliance with ACR guidelines. The impact of this intervention is pending.

**Learning Objectives:**

Identify risk factors for the development of osteoporosis in men.

Review current American College of Rheumatology guidelines for the prevention of glucocorticoid-induced osteoporosis.

**Self Assessment Questions:**

T/F: Patients receiving high-dose, long-term glucocorticoid therapy should receive calcium and vitamin D unless contraindicated.

T/F: Men have less risk of developing osteoporosis while on long-term glucocorticoid therapy than women.

**THE EFFECT OF A SEDATION, ANALGESIA, AND DAILY WAKEUP PROTOCOL ON THE DURATION OF MECHANICAL VENTILATION IN CRITICALLY ILL PATIENTS**

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**Purpose:** The purpose of this observational study was to evaluate the duration of mechanical ventilation in patients admitted to the medical intensive care unit (MICU) at Indiana University Hospital who were placed on an established sedation, analgesia, and daily wakeup protocol. The average time on the ventilator in patients enrolled in the protocol was compared to the patients who were on the ventilator prior to initiation of the protocol.

**Methods:** Data were collected retrospectively using patients from the medicine services admitted to the MICU from January 2002 through March 2002 until there were at least thirty patients included. These patients were not enrolled in the sedation, analgesia, and daily wakeup protocol. Charts were reviewed, and patients meeting the criteria of the study were included in the pre data. Data were also collected prospectively on the patients enrolled in the protocol. Data collection will continue until at least thirty patients are included. Data collected were used to determine duration of mechanical ventilation, length of ICU stay, and length of hospital stay. The percent of time the patients met their pain and Sedation Agitation Scale (SAS) goal were recorded. Total doses of medications utilized were compared between the two groups. Adverse effects that occurred during the protocol (i.e. re-intubation, self-extubation, and accidental intravenous line/drain/tube removal by the patient) and the number of patients requiring tracheostomy were also recorded.

**Results:** Pending

**Learning Objectives:**

Will provide an overview of the SCCM guidelines for sedation and analgesia in mechanically ventilated patients.

Will describe the sedation, analgesia, and daily wakeup protocol.

**Self Assessment Questions:**

What are the major differences between morphine, hydromorphone, and fentanyl?

According to Kress et al., what benefits do daily wakeup protocols have?

## **A COMPARISON OF EMPIRIC ANTIBIOTIC THERAPY WITH CEFTAZIDIME AND CEFEPIME IN NEUTROPENIC FEVER PATIENTS**

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**Purpose:** Chemotherapy may cause life threatening toxicities including myelosuppression. Neutropenic patients are at high risk of developing bacterial infections with a high mortality rate. Febrile neutropenic patients should be presumed to be infected and treated promptly. Early empiric therapy with a broad spectrum bactericidal antibiotic is standard practice in treating these patients. The Infectious Disease Society of America's initial antibiotics of choice include one of the following agents: cefepime, ceftazidime, imipenem or meropenem. The University Hospital has recently removed ceftazidime and added cefepime to its formulary. The purpose of this study is to compare the use of these two agents for empiric therapy in a group of neutropenic fever patients. The null hypothesis is there is no difference in outcomes between empiric therapy with ceftazidime and cefepime in neutropenic fever patients.

**Methods:** 100 patients will be identified by retrospective chart review. Inclusion criteria are admission for neutropenic fever and empiric therapy with ceftazidime or cefepime. Data collected includes age, gender, type of cancer, length of stay, initial absolute neutrophil count, nadir, antibiotic dose and duration, days until afebrile, and GCSF use. The primary outcome is response to empiric therapy. Patients will be classified as (1) Success: survival of the neutropenic episode and free of fever and signs of fever with no change in antibiotic therapy; (2) No response: survival of the neutropenic episode, free of fever and the signs of fever after a change in the empiric antibiotic therapy; (3) Failure: the patient did not survive the neutropenic episode.

**Results:** 49 patients have been identified, 26 in the cefepime group (10M /16F) and 23 in the ceftazidime group (16M/7F). Complete outcomes data has been collected on 27 patients. The primary outcomes are: success 67% (18/27), (cefepime 69%(11/16) and ceftazidime 64%(7/11)). Thusfar, no differences have been identified between the groups.

### **Learning Objectives:**

Demonstrate a working knowledge of the Infectious Disease Society of America's current guidelines for the use of antimicrobial agents in neutropenic patients with cancer. To evaluate and compare the use of ceftazidime and cefepime in a group of neutropenic fever patients.

### **Self Assessment Questions:**

According to the current IDSA guidelines, neutropenia is defined as a neutrophil count of < 300 cells/mm<sup>3</sup> or a count of <1000 cells/mm<sup>3</sup> with a predicted decrease to < 300 cells/mm<sup>3</sup>. T or F

According to the current IDSA guidelines, cefepime is preferred over ceftazidime for empiric antibiotic therapy in neutropenic fever patients. T or F

## **THE EFFECT OF COMPUTERIZED PRESCRIBER ORDER ENTRY ON PRESCRIBING PATTERNS IN THE NEONATAL INTENSIVE CARE UNIT**

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Computerized prescriber order entry (CPOE) with decision support is a powerful tool for decreasing medication errors and directing prescribers to an appropriate medication regimen. Most CPOE systems offer a recommended dose to prescribers, but few remove the ability of the prescriber to override warning messages. Previous data indicate that implementation of CPOE in adult populations leads to both a decrease in variability of doses, and in doses exceeding the maximum dose.

On March 12, 2002, the Neonatal Intensive Care Unit (NICU) at The Ohio State University Medical Center converted its paper-based ordering system with medication dosing monographs to CPOE with medication dosing tailored to the neonatal population. Safety features of the system include pre-filled recommended dose fields and non-overrideable alerts for greater than maximum doses.

NICU medication orders written before and after CPOE implementation were analyzed to assess the effect of CPOE on prescribing. It was hypothesized that prescribers would choose the recommended dose more frequently and that doses exceeding the maximum dose would be eliminated with CPOE. Measurements included the number and extent of both variations from recommended doses, and orders that exceed maximum doses. Final analysis will compare pre-CPOE and post-CPOE results.

Preliminary results show prescribers ordered the recommended dose with much greater frequency using CPOE (75.6%) compared with the paper order system (4.3%). Doses exceeding the maximum were decreased from 14.9% to 0% between pre- and post-CPOE periods. The recommended dose variability (percent deviation from recommended dose) decreased from +/-217% before CPOE to +/- 9% after CPOE implementation.

Preliminary data indicate NICU prescribers choose recommended doses more frequently with CPOE than with paper orders. CPOE with non-overrideable maximum doses results in elimination of prescribing in excess of the maximum dose. In addition, the overall variability from recommended doses decreases with the implementation of CPOE with recommended doses.

### **Learning Objectives:**

To understand the functionality of the computerized prescriber order entry system implemented in the Neonatal Intensive Care Unit at The Ohio State University Medical Center.

To show the effect of computerized prescriber order entry on prescribing patterns in the Neonatal Intensive Care Unit.

### **Self Assessment Questions:**

Computerized prescriber order entry changes prescribing patterns. (T/F)

The variability of dosing decreases with CPOE. (T/F)

**EVALUATION OF PATIENT OUTCOMES AND RESOURCE UTILIZATION FROM CLINICAL PHARMACIST INTERVENTIONS AT A UNIVERSITY HOSPITAL PHARMACOTHERAPY CLINIC**

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Due to the changing role of pharmacists and tightening health care budgets, proving the value of pharmacist services has become increasingly important. Measuring changes in patient outcomes and cost avoidance as a result of pharmacist interventions would be useful information to demonstrate the worth of pharmacist services.

The Pharmacotherapy Clinic, situated in the University Medical Practices of The University Hospital of the Health Alliance in Cincinnati, Ohio, is a pharmacist-directed, appointment-based clinic caring for adult internal medicine patients. The current study is a prospective, observational, single-center, nonrandomized study evaluating patient outcomes, pharmacist interventions, and cost-effectiveness of pharmacist services in the Pharmacotherapy Clinic.

Patients with hypertension, dyslipidemia, and/or diabetes mellitus type 2 who had their first appointment with the Pharmacotherapy Clinic on July 1, 2002 through September 30, 2002 were included in the study. The primary outcome measures are the change in the blood pressure, low-density lipoprotein, and/or hemoglobin A1C, respectively, and the change in the number of Emergency Department (ED) visits, hospitalizations, and/or primary care physician (PCP) visits before and after six months of care. Secondary outcomes are the number and type of pharmacist interventions as recorded on a personal digital assistant, and the estimated cost avoidance due to the potential reduction in ED visits, hospitalizations, and PCP visits.

Patient outcomes and pharmacist interventions remain under investigation, with data collection and evaluation currently being conducted.

**Learning Objectives:**

To assess the value of clinical interventions and change in clinical markers by pharmacists practicing in the Pharmacotherapy Clinic

To calculate the cost avoidance attained from Pharmacotherapy Clinic services

**Self Assessment Questions:**

Proving the value of pharmacist services in primary care is unnecessary in today's health care environment. T or F.

Pharmacist services can be evaluated by measuring changes in clinical markers. T or F.

**HEMODIALYSIS DRUG CLEARANCE: EVALUATION OF FOUR CEPHALOSPORINS GIVEN THREE TIMES PER WEEK**

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**BACKGROUND**

Chronic hemodialysis patients are predisposed to colonization with resistant gram-positive and gram-negative organisms for multiple reasons. Vancomycin is widely used empirically in this population because it covers common pathogens, can be given three times a week post-dialysis by utilizing the dialysis access site, and has published data to prove that therapeutic blood levels are achieved. Over the past decade, overuse of this drug has induced vancomycin resistance, creating the need to control its use by utilizing other antibiotics that are equally efficacious and easy to use. Cefazolin, ceftazidime, cefoxitin, and cefepime have been shown to be adequate treatment for many infections in this population. Despite limited literature on drug clearance, these agents are being used in centers all over the country, dosed after each dialysis session via the dialysis access site. With known pharmacokinetic parameters of these cephalosporins, which can be established by obtaining pre- and post-dialysis blood levels, it is hypothesized that administration after hemodialysis can safely and confidently be viewed as an alternative that avoids the necessity for placement of an additional access site [i.e., peripherally inserted central catheter line (PICC line)], which may, in turn, reduce the risk of access-related infections, decrease length of hospital stay, and preserve other possible access sites for future use.

**METHODOLOGY**

Once approved by the Investigational Review Board, pharmacists, nurses, and physicians were educated on which patients were eligible for the study. Hemodialysis nurses were instructed on the process for drawing pre- and post-hemodialysis levels and administering the cephalosporin via the dialysis access site after the session. Once levels returned, primary investigators assessed if levels were in therapeutic ranges and followed microbiologic cultures to confirm the effectiveness of dosing in this manner.

**CONCLUSION**

Results and summary will be presented.

**Learning Objectives:**

Assess our ability to give cefazolin, ceftazidime, cefoxitin, and cefepime three times per week after hemodialysis.

Utilize data obtained from this study to change prescribing patterns that may potentially decrease need for PICC line insertion, decrease the number of infectious complications, and decrease length of hospital stay.

**Self Assessment Questions:**

Administering cefazolin, cefoxitin, ceftazidime, and cefepime three times per week after dialysis achieves therapeutic concentrations. T or F

Thrice weekly administration of cefazolin, cefoxitin, ceftazidime, or cefepime has decreased the number of PICC lines needed. T or F